VOLUME 7 PART 7

NORTH AMERICAN FLORA

(UREDINALES)

AECIDIACEAE (continuatio)

JOSEPH CHARLES ARTHUR

BULLARIA

JOSEPH CHARLES ARTHUR AND EDWIN BUTTERWORTH MAINS

TELEUTOSPORA

JOSEPH CHARLES ARTHUR AND GUY RICHARD BISBY

MICROPUCCINIA (pars)

JOSEPH CHARLES ARTHUR AND HERBERT SPENCER JACKSON

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ANNOUNCEMENT

NORTH AMERICAN FLORA is designed to present in one work descriptions of all plants growing, independent of cultivation, in North America, here taken to include Greenland, Central America, the Republic of Panama, and the West Indies, except Trinidad, Tobago, and Curaçao and other islands off the north coast of Venezuela, whose flora is essentially South American.

The work will be published in parts at irregular intervals, by the New York Botanical Garden, through the aid of the income of the David Lydig Fund bequeathed by Charles P. Daly.

It is planned to issue parts as rapidly as they can be prepared, the extent of the work making it possible to commence publication at any number of points. The completed work will form a series of volumes with the following sequence:

Volume 1. Myxomycetes, Schizophyta.

Volumes 2 to 10. Fungi.

Volumes 11 to 13. Algae.

Volumes 14 and 15. Bryophyta.

Volume 16. Pteridophyta and Gymnospermae.

Volumes 17 to 19. Monocotyledones.

Volumes 20 to 34. Dicotyledones.

The preparation of the work has been referred by the Scientific Directors of the Garden to a committee consisting of Dr. N. L. Britton, Dr. W. A. Murrill, and Dr. J. H. Barnhart.

Professor John M. Coulter, of the University of Chicago; Mr. Frederick V. Coville, of the United States Department of Agriculture; and Professor William Trelease, of the University of Illinois, have consented to act as an advisory committee.

Each author will be wholly responsible for his own contributions, being restricted only by the general style adopted for the work, which must vary somewhat in the treatment of diverse groups.

The subscription price is fixed at $1.50 for each part; it is expected that four or five parts will be required for each volume. A limited number of separate parts will be sold at $2.00 each. Address:

THE NEW YORK BOTANICAL GARDEN
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7. **Klebahnia Montanoae** (Arth. & Holway) Arthur.

Uromyces Montanoae Arth. & Holway; Arth. Mycologia **10**: 127. 1918.

O. Pycnia unknown.

II. Uredinia hypophyllous, scattered, round or oblong, 0.1–1 mm. across, early naked, pulverulent, cinnamon- or light chestnut-brown, ruptured epidermis evident; urediniospores with pores in optical section appearing obovate-triangular or flattened-triangular, 23–26 μ wide, with pores in surface view obovoid or elliptic, 19–23 by 23–28 μ; wall cinnamon-brown, thin, 1–1.5 μ, moderately echinulate, the pores 2, equatorial.

III. Telia hypophyllous, scattered, round, 0.3–0.5 mm. in diameter, early naked, compact, dark cinnamon-brown becoming cinereous from germination, ruptured epidermis inconspicuous; teliospores narrowly obovoid or ovoid, 18–21 by 29–40 μ, rounded above, rounded or narrowed below; wall cinnamon-brown, thin, 1 μ, thickened at apex, 4–7 μ, smooth; pedicel colorless or yellowish, up to 50 μ long.

ON CARDUACEAE:
Montanoa dumicola Klatt, Costa Rica.
Montanoa hibiscifolia Benth., Guatemala.
Montanoa Pittieri Rob. & Greenm., Guatemala.
TYPE LOCALITY: San Lucas Toliman, Solola, Guatemala, on *Montanoa Pittieri*.
DISTRIBUTION: Central America.

8. **Klebahnia Bidentis** (P. Henn.) Arth. Mycologia 7: 196. 1915.

Uredo Bidentis P. Henn. Hedwigia **35**: 251. 1896.
Puccinia Bidentis Dietel & Holway; Holway, Bot. Gaz. **24**: 32. 1897.
Uredo bidenticola P. Henn. Hedwigia **37**: 279. 1898.
Uredo amaniensis P. Henn. Bot. Jahrb. **38**: 106. 1905.
Uromyces bidenticola Arth. Mycologia **9**: 71. 1917.

O. Pycnia amphigenous, numerous, in small groups, honey-yellow becoming darker, globoid, 100–140 μ in diameter; ostiolar filaments few, 20–30 μ long; pycniospores large, 5–7 μ in diameter.

II. Uredinia amphigenous, circinating about the pycnia or scattered on indefinite, discolored spots, roundish, 0.2–0.8 mm. across, rather tardily naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores ellipsoid or obovoid, 19–27 by 27–35 μ, sometimes slightly flattened with pores in optical section; wall cinnamon-brown, variable in thickness, 1.5–3 μ, moderately and distinctly echinulate, the pores 2, equatorial or slightly superequatorial.

III. Telia amphigenous, usually hypophyllous, frequently crowded or circinately confluent on pale, discolored spots, roundish, 0.2–1 mm. across, early naked, pulvinate, light cinnamon-brown becoming cinereous by germination, ruptured epidermis inconspicuous; teliospores obovoid or oblong-clavate, 16–24 by 29–45 μ, rounded above and slightly narrowed below; wall pale cinnamon-brown or colorless, very thin, 1 μ, thickened into a colorless umbo at apex, 5–10 μ, smooth; pedicel colorless, once to twice length of spore, persistent.

ON CARDUACEAE:
Bidens expansa Greene, California.
Bidens heterophylla Ortega(*B. arguta* H.B.K.), Mexico (state?); Guatemala.
Bidens Holwayi Sherff & Blake, Guatemala.
Bidens leucantha L., Florida; Mexico (state), Morelos, Puebla; Guatemala; Bahamas; Cuba; Porto Rico; Jamaica; Martinique.
Bidens pilosa L., California; Costa Rica; Guatemala; Nicaragua; Bermuda; Cuba; Porto Rico; Martinique.
Bidens squarrosa H.B.K. (*B. tereticaulis* DC., *B. tereticaulis antiguensis* Coult.), Oaxaca; Costa Rica; Guatemala.
Bidens sp., Hidalgo.
Cosmos caudatus H.B.K., Porto Rico; Jamaica.
TYPE LOCALITY: Ecuador, on *Bidens andicola*.
DISTRIBUTION: Southern Florida and southern California, southward through the West Indies and Central America; also in South America, Africa, and Asia.
ILLUSTRATIONS: McAlpine, Rusts Austr. *pl. 28, f. 243, 244.*
EXSICCATI: Barth. Fungi Columb. *4493, 4691, 4887;* Barth. N. Am. Ured. *782, 783, 1686, 2484.*

35. *BULLARIA DC. Fl. Fr. 2: 226. 1805.

Argomyces Arth. N. Am. Flora **7** : 217. 1912.
Peristemma Sydow, Ann. Myc. **19** : 175. 1921.
Schroeterella Sydow, Ann. Myc. **20** : 119. 1922.

Cycle of development includes pycnia, primary uredinia (functioning as aecia), secondary uredinia, and telia, only occasionally showing distinct alternating phases; autoecious. Pycnia and other sori subepidermal.

Pycnia embedded in the tissues of the host, usually globoid or flask-shaped, with ostiolar filaments.

Uredinia erumpent, definite, without peridium, and without paraphyses except in a few species, generally of two sorts, primary and secondary; the primary uredinia usually accompanied by pycnia, generally in groups, sometimes on much hypertrophied areas, or forming distinct galls, the secondary uredinia unaccompanied by pycnia, usually without definite arrangement. Urediniospores borne singly on pedicels, globoid, ellipsoid, or obovoid; wall in most species colored, sometimes laminate, and in a few species much thicker above, echinulate (verrucose in *Bullaria Cordiae*), the pores one to several, variously arranged.

Telia erumpent, soon naked, or occasionally long covered by the epidermis. Teliospores free, pedicelled, two-celled, occasionally with a few one-celled (mesospores); wall generally colored, in a few species colorless, firm, smooth or verrucose, the pore of the upper cell apical or nearly so, of the lower cell variable.

Type species, *Bullaria Umbelliferarum* DC. (on *Umbelliferae*).

Host belonging to family Fabaceae.
- Urediniospore-wall thin (1–2 μ), with 2 pores. — 1. *B. Arachidis.*
- Urediniospore-wall thicker (1.5–2.5 μ), with 3 or 4 pores. — 2. *B. Zorniae.*

Host belonging to family Malpighiaceae.
- Urediniospore-wall very thick, 4–7 μ.
  - Teliospores 26–35 × 35–50 μ; pedicel swollen next to spore up to 26 μ wide. — 3. *B. circinata.*
  - Teliospores 37–41 × 50–58 μ; pedicel sometimes slightly swollen at base. — 4. *B. rubricans.*
- Urediniospore-wall thinner, 1.5–3 μ.
  - Urediniospores large, 25–32 × 39–45 μ; teliospores colorless. — 5. *B. barbatula.*
  - Urediniospores smaller, 18–27 × 24–39 μ; teliospores colored.
    - Urediniospore-pores 6–8, scattered. — 6. *B. Echinopteridis.*
    - Urediniospore-pores 3, usually equatorial. — 7. *B. inflata.*

Host belonging to family Euphorbiaceae.
- Teliospores 21–23 × 48–66 μ; wall 13–20 μ thick at apex. — 8. *B. longipes.*
- Teliospores 23–31 × 37–52 μ; wall 5–13 μ thick at apex. — 9. *B. velata.*

Host belonging to family Rhamnaceae.
- Urediniospore-pores 2 or 3. — 10. *B. Gouaniae.*
- Urediniospore-pore 1. — 11. *B. invaginata.*

Host belonging to family Myrtaceae. — 12. *B. Psidii.*

Host belonging to family Ammiaceae.
- Urediniospore-wall of uniform thickness. — 13. *B. Hydrocotyles.*
- Urediniospore-wall thickened above.
  - Teliospores smooth.
    - Teliospore-wall thin, 1–1.5 μ.
      - Teliospores oblong, 29–45 μ long. — 14. *B. Ziziae.*
      - Teliospores cylindric, 37–63 μ long. — 15. *B. Coelopleuri.*
    - Teliospore-wall thicker, more than 2 μ.
      - Teliospore-wall 2–3.5 μ thick. — 16. *B. bullata.*
      - Teliospore-wall 3–5 μ thick. — 17. *B. Prionosciadii.*
  - Teliospores rough.
    - Teliospores marked by a few, faint, longitudinal ridges. — 14. *B. Ziziae.*
    - Teliospores uniformly verrucose.
      - Teliospore-wall thick, 3–5 μ. — 17. *B. Prionosciadii.*
      - Teliospore-wall thinner, less than 3 μ.
        - Urediniospores 19–27 × 29–35 μ; wall 2.5–4 μ thick at apex. — 18. *B. Cynomarathi.*
        - Urediniospores 26–35 × 35–43 μ; wall 5–9 μ thick at apex. — 19. *B. Ellisii.*

Host belonging to family Apocynaceae. — 20. *B. Vincae.*
Host belonging to family Ehretiaceae. — 21. *B. Cordiae.*
Host belonging to family Verbenaceae. — 22. *B. elatipes.*

Host belonging to family Lamiaceae.
- Urediniospore-pores equatorial; teliospores colored. — 23. *B. impedita.*
- Urediniospore-pores near hilum; teliospores colorless. — 24. *B. parilis.*

Host belonging to family Solanaceae.
- Urediniospore-pores 3, equatorial; teliospore-wall thin, 1.5 μ. — 25. *B. adducta.*
- Urediniospore-pores 8 in two zones; teliospore-wall thick, 2.5–5 μ.

* *Bullaria* in collaboration with EDWIN BUTTERWORTH MAINS.

Teliospore-pedicel globoid. 26. *B. globosipes.*
Teliospore-pedicel fusiform-oblong. 27. *B. tumidipes.*
Host belonging to family Lobeliaceae. 28. *B. vacua.*
Host belonging to family Carduaceae.
Of the tribe Vernonieae.
Teliospores pale cinnamon-brown or colorless.
Teliospores usually less than 60 μ long. 29. *B. insulana.*
Teliospores usually more than 60 μ long. 30. *B. Arthuriana.*
Teliospores strongly colored.
Teliospores minutely verrucose.
Urediniospore-pores scattered, indistinct. 31. *B. fuscella.*
Urediniospore-pores approximately equatorial.
Urediniospore-pores usually 3; teliospores much thicker above. 32. *B. Vernoniae.*
Urediniospore-pores usually 2; teliospores slightly thicker above.
Teliospore-wall 2.5–3 μ thick. 33. *B. inaequata.*
Teliospore-wall 3–6 μ thick. 34. *B. semiinsculpta.*
Teliospores prominently verrucose.
Teliospores closely verrucose.
Teliospore-wall 3–6 μ thick; telia chiefly epiphyllous. 34. *B. semiinsculpta.*
Teliospore-wall 3–4 μ thick; telia chiefly hypophyllous. 35. *B. idonea.*
Teliospores sparsely verrucose.
Teliospore-wall moderately thick, 3–4 μ; telia epiphyllous. 36. *B. praealta.*
Teliospore-wall very thick, 4–6 μ. 37. *B. egregia.*
Of the tribe Eupatorieae.
Teliospores prominently verrucose.
Urediniospore-pores 2 (rarely 3), equatorial. 38. *B. Conoclinii.*
Urediniospore-pores 2 (rarely 3), basal.
Teliospore-wall 1–1.5 μ thick. 40. *B. basiporula.*
Teliospore-wall 3–4 μ thick. 41. *B. Hodgsoniana.*
Teliospores minutely verrucose.
Urediniospores 23–28 μ long. 39. *B. concinna.*
Urediniospores 26–34 μ long. 48. *B. subdecora.*
Teliospores smooth, or appearing so in water.
Teliospore-pedicel firm, persistent.
Walls of pedicel thin.
Urediniospores globoid. 47. *B. Kuhniae.*
Urediniospores reniform. 44. *B. inanipes.*
Walls of pedicel thick, nearly obliterating lumen.
Urediniospores globoid. 42. *B. solidipes.*
Urediniospores reniform. 43. *B. Espinosarum.*
Teliospore-pedicel fragile, largely deciduous.
Teliospore-wall thin (1.5–2 μ). 45. *B. inermis.*
Teliospore-wall thick (3–6 μ).
Teliospore-wall slightly thicker above.
Teliospore-wall smooth.
Teliospores with prominent papilla. 47. *B. Kuhniae.*
Teliospores with low papilla. 46. *B. redempta.*
Teliospore-wall minutely verrucose. 48. *B. subdecora.*
Teliospore-wall much thicker above.
Teliospores 26–30 μ broad. 39. *B. concinna.*
Teliospores 32–35 μ broad. 49. *B. decora.*
Of the tribe Astereae. 50. *B. Baccharidis-multiflorae.*
Of the tribe Heliantheae.
Teliospores finely verrucose.
Urediniospore-pores superequatorial.
Sori from a diffused mycelium. 51. *B. triannulata.*
Sori from a limited mycelium. 52. *B. Balsamorhizae.*
Urediniospore-pores equatorial. 53. *B. proba.*
Teliospores smooth. 54. *B. Enceliae.*
Of the tribe Helenieae. 55. *B. Gaillardiae.*
Of the tribe Anthemideae.
Teliospores verrucose throughout. 56. *B. Chrysanthemi.*
Teliospores minutely verrucose above. 57. *B. Absinthii.*
Of the tribe Cynareae.
Sori from a limited mycelium.
Teliospore-wall thin (1–3 μ).
Teliospore-wall 1–2 μ thick. 58. *B. Cirsii.*
Teliospore-wall 1.5–2.5 μ thick. 63. *B. Bardanae.*
Teliospore-wall 2–3 μ thick. 62. *B. Carthami.*
Teliospore-wall thick (3–3.5 μ). 61. *B. irrequista.*
Sori from a diffused mycelium.
Urediniospore-pores 2. 60. *B. Cyani.*
Urediniospore-pores 3. 59. *B. suaveolens.*
Host belonging to family Cichoriaceae.

Teliospore-wall 1 μ or less thick. 64. *B. chondrillina.*
Teliospore-wall usually more than 1 μ thick.
Urediniospore-wall less than 3 μ thick. 65. *B. Hieracii.*
Urediniospore-wall more than 3 μ thick. 66. *B. Pinaropappi.*

1. **Bullaria** (?) **Arachidis** (Speg.) Arthur & Mains.

Puccinia Arachidis Speg. Anal. Soc. Ci. Argent. **17**: 90. 1884.
Uredo Arachidis Lagerh. Tromsö Mus. Aarsh. **17**: 106. 1894.
Uromyces Arachidis P. Henn. Hedwigia **35**: 224. 1896.

O. Pycnia unknown.

II. Uredinia mostly hypophyllous, scattered or irregularly grouped, sometimes confluent, round or oblong, 0.2–0.8 mm. across, tardily naked, pulverulent, dark cinnamon-brown, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovoid, 16–22 by 23–29 μ; wall cinnamon-brown, thin, 1–2 μ, moderately echinulate, the pores 2, equatorial or slightly subequatorial.

III. Telia chiefly hypophyllous, small, 0.2–0.3 mm. in diameter, scattered, prominent, soon naked, chestnut-brown, ruptured epidermis conspicuous; teliospores oblong or obovate, 14–16 by 38–42 μ, rounded or obtuse above, somewhat narrowed below, slightly constricted at septum; wall moderately thick, chestnut-brown, smooth; pedicel colorless, slender, once to once and a half length of spore.

ON FABACEAE:
Arachis hypogaea L., Florida; Cuba; Porto Rico; Grenada; Guadaloupe; Montserrat.
TYPE LOCALITY: Caá-guazú, Paraguay, on *Arachis hypogaea.*
DISTRIBUTION: Southern Florida and the West Indies; also in South America.

2. **Bullaria** (?) **Zorniae** (Dietel) Arth. Bull. Torrey Club. **49** : 190. 1922.

Uredo Zorniae Dietel, Hedwigia **38**: 257. 1899. (Not *Puccinia Zorniae* McAlpine, 1906.)
Puccinia offuscata Arth. Bull. Torrey Club **47**: 469. 1920.

O. Pycnia unknown.

II. Uredinia amphigenous, scattered, round or oval, 0.3–1 mm. long, rather tardily naked, pulverulent, dark cinnamon-brown, ruptured epidermis conspicuous; paraphyses peripheral, scarcely rising above the spore-mass, slightly clavate, 5–9 by 29–48 μ, the wall 1 μ thick, colorless, smooth; urediniospores broadly ellipsoid or broadly obovoid, 18–23 by 23–29 μ; wall cinnamon-brown, 1.5–2.5 μ thick, finely and closely echinulate, the pores 3 or 4, equatorial.

III. Telia hypophyllous, few, scattered, round, 0.1–0.3 mm. in diameter, rather tardily naked, compact, dark cinnamon-brown, ruptured epidermis conspicuous; teliospores clavate, 13–18 by 32–53 μ, rounded above, narrowed below, slightly constricted at septum, germinating upon maturity; wall light golden-brown, 1–2 μ thick, slightly thickened at apex, 1–5 μ, smooth: pedicel up to one half length of spore, colorless.

ON FABACEAE:
Zornia bracteata (Walt.) Gmel. (*Z. tetraphylla* Michx.), Florida.
Zornia diphylla (L.) Pers., Cuba; Porto Rico.
TYPE LOCALITY: Copacabana, Rio de Janeiro, Brazil, on *Zornia diphylla.*
DISTRIBUTION: Southwestern Florida and the West Indies; also in South America.

3. **Bullaria** (?) **circinata** (Schw.) Arthur & Mains.

Uredo circinata Schw.; Berk. & Curt. Jour. Acad. Phila. **2**: 282. 1853.
Puccinia circinata Arth. Am. Jour. Bot. **5**: 471. 1918.

O. Pycnia unknown.

II. Uredinia amphigenous, scattered or in groups 2–3 mm. in diameter, rounded or oval, 0.3–1 mm. across, rather tardily naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores (dry or in alcohol) broadly ellipsoid or globoid, 22–26 by 26–32 μ; wall golden- or dark cinnamon-brown, 2.5–3 μ thick, very sparsely and prominently echinulate, the echinulations 7–10 μ apart, 2.5–4 μ long, 1 μ wide, colorless, the pores 2–4, equatorial; urediniospores in water mount swelling, 27–32 by 32–40 μ; wall 5–7 μ thick, consisting of a cinnamon-brown inner layer, 3–4 μ thick and a colorless outer layer, 1.5–4 μ thick.

III. Telia amphigenous, scattered, round or oval, 0.3–1 mm. across, rather tardily naked,

somewhat pulverulent, brownish-black, ruptured epidermis conspicuous; teliospores broadly ellipsoid, 26–35 by 35–50 μ, rounded at both ends, not or slightly constricted at septum; wall dark chocolate-brown, uniformly 3–5 μ thick, rather obscurely reticulate, the areolae about 2–3 μ across; pedicel colorless, up to 50 μ long, in water swelling next to the spore to form a spherical enlargement up to 26 μ in diameter, attached laterally.

ON MALPIGHIACEAE:
?*Stigmaphyllon* sp., Guatemala.
TYPE LOCALITY: Surinam, on unnamed host, probably *Stigmaphyllon*.
DISTRIBUTION: Eastern Guatemala; also in South America.

4. **Bullaria rubricans** (Holway) Arthur & Mains.

Puccinia rubricans Holway, Jour. Myc. **10**: 165. 1904.

O. Pycnia hypophyllous, crowded in circular groups 1–1.5 mm. across, noticeable, yellowish or whitish, globoid, 110–130 μ in diameter; ostiolar filaments up to 90 μ long.

II. Uredinia of the primary form circinating about the pycnia upon brilliant red spots, 0.2–0.7 mm. in diameter, otherwise similar to the secondary form; secondary uredinia mostly hypophyllous, scattered, causing smaller reddish discolorations, circular or oval, 0.2–0.8 mm. across, somewhat tardily naked, cinnamon-brown, ruptured epidermis noticeable; urediniospores of both forms broadly ellipsoid or globoid, 32–35 by 34–43 μ; wall pale golden-brown, very thick, 4–7 μ, sometimes showing a thin outer colorless layer, 1 μ or less, sparsely and prominently echinulate, the pores 4, equatorial, rather indistinct.

III. Telia hypophyllous, scattered, round, 0.3–0.8 mm. in diameter, early naked, compact, blackish, ruptured epidermis noticeable; teliospores broadly ellipsoid, 37–41 by 50–58 μ, rounded or obtuse above, rounded below, not constricted at septum; wall chestnut-brown, very thick, 4–7 μ, thicker and paler at apex, 8–10 μ, closely pitted, the pits 2–3 μ in diameter; pedicel colorless below, yellowish-brown next to spore, up to 70 μ long, roughened and slightly swollen at the base.

ON MALPIGHIACEAE:
Banisteria Portillana (S. Wats.) C. B. Robinson (*Heteropteris Portillana* S. Wats.), Jalisco.
TYPE LOCALITY: Rio de Janeiro, Brazil, on *Myrica* sp., error for *Banisteria* sp.
DISTRIBUTION: Southwestern Mexico; also in South America.
ILLUSTRATIONS: Holway, N. Am. Ured. 1: *pl. 24, f. 86a, b.*

5. **Bullaria barbatula** (Arth. & Johnston) Arthur & Mains.

Puccinia barbatula Arth. & Johnston, Mem. Torrey Club **17**: 144. 1918.

O. Pycnia amphigenous, in small groups upon brownish discolored areas 1–3 mm. across, noticeable, dark-brown, globoid, 70–128 μ in diameter; ostiolar filaments up to 40 μ long.

II. Uredinia hypophyllous, few, circinating about the pycnia, oval or oblong, 0.2–0.8 mm. long, originating deep within the tissues and remaining partly covered by them, opening by slit or large pore, somewhat pulverulent, dark cinnamon-brown; urediniospores broadly ellipsoid or obovoid, 25–32 by 39–45 μ; wall dark cinnamon-brown, 2–2.5 μ thick, strongly and very sparsely echinulate, the echinulations colorless, 2–2.5 μ long, the pores 2, equatorial.

III. Telia hypophyllous, crowded about the uredinia on more or less irregular, light-colored areas, oval or oblong, 0.3–1 mm. long, long covered by the overarching tissue, whitish or pale-brown, somewhat pulverulent; teliospores oblong or oblong-clavate, 18–26 by 35–48 μ, rounded above, rounded or slightly narrowed below, somewhat constricted at septum; wall colorless, uniform in thickness, 1.5–2.5 μ, smooth; pedicel colorless, about half length of spore, 13–15 μ wide.

ON MALPIGHIACEAE:
Banisteria laurifolia L., Cuba.
TYPE LOCALITY: Paso Estancia, Cuba, on *Banisteria laurifolia*.
DISTRIBUTION: Eastern Cuba.

6. **Bullaria Echinopteridis** (Holway) Arthur & Mains.

Puccinia Echinopteridis Holway, Jour. Myc. **10**: 164. 1904.

O. Pycnia amphigenous, gregarious on yellowish spots, 2–2.5 mm. in diameter, rather inconspicuous, light-yellow or light-brown, flattened-globoid, 71–103 by 90–118 μ; ostiolar filaments short, 16–32 μ.

I. Uredinia of the primary form crowded on yellowish spots 2–5 mm. across, otherwise similar to the secondary form; secondary uredinia hypophyllous, scattered, round or oblong, 0.3–1.5 mm. long, rather tardily naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores of both forms broadly obovoid or ellipsoid, 18–26 by 26–34 μ; wall cinnamon-brown, 1.5–2 μ, moderately echinulate, the pores 6–8, scattered.

III. Telia amphigenous, scattered, circular, 0.2–0.5 mm. in diameter, early naked, pulverulent, blackish, ruptured epidermis noticeable; teliospores ellipsoid, 26–33 by 35–43 μ, rounded at both ends, slightly or not constricted at septum; wall dark chestnut- or chocolate-brown, uniformly 2.5–3.5 μ thick, conspicuously reticulate, the areolae 2–3 μ across; pedicel colorless, 9 by 23–39 μ, swelling in water up to 24–42 μ across next to spore, attached usually at or near septum.

ON MALPIGHIACEAE:
Echinopterys eglandulosa (A. Juss.) Small (*E. Lappula* A. Juss.), Jalisco, Puebla.
TYPE LOCALITY: Guadalajara, Mexico, on *Echinopterys Lappula*.
DISTRIBUTION: Southern Mexico.
ILLUSTRATIONS: Holway, N. Am. Ured. **1**: *pl. 25, f. 88a, b, c.*
EXSICCATI: Sydow, Ured. *1870*.

7. **Bullaria inflata** (Arth.) Arthur & Mains.

Puccinia inflata Arth. Bull. Torrey Club **33**: 516. 1906.

O. Pycnia mostly hypophyllous, crowded in circular groups 0.5–1.5 mm. in diameter, noticeable, whitish or brownish, globoid, 80–110 μ in diameter; ostiolar filaments up to 65 μ long.

II. Uredinia of the primary form mostly epiphyllous, crowded in circular groups 2–3 mm. in diameter about the pycnia, otherwise similar to the secondary form; secondary uredinia mostly hypophyllous, scattered, round or oblong, 0.1–1 mm. across, remaining partly covered by the ruptured epidermis, opening by a slit, pulverulent, dark cinnamon- or chestnut-brown, ruptured epidermis evident; urediniospores of both forms broadly ellipsoid or obovoid, 19–27 by 24–37 μ; wall dark cinnamon-brown, 1.5–2.5 μ thick, sparsely and prominently echinulate, the pores 3, usually approximately equatorial, sometimes somewhat scattered.

III. Telia amphigenous, scattered, or crowded in groups 3–6 mm. in diameter, round or oblong, 0.2–1 mm. across, remaining partly covered by the ruptured epidermis, opening by a slit, brownish-black, ruptured epidermis evident; teliospores ellipsoid, 23–32 by 29–42 μ, rounded at both ends, not constricted at septum; wall dark chestnut-brown, 2.5–4 μ thick, conspicuously reticulate, the areolae 2–3 μ across; pedicel colorless, once or twice length of spore, in water swelling next to spore to form a globoid enlargement 16–26 μ in diameter, laterally attached, usually at septum.

ON MALPIGHIACEAE:
Stigmaphyllon lingulatum (Poir.) Small, Porto Rico; Mona Island.
Stigmaphyllon periplocifolium (Desf.) A. Juss., Cuba.
Stigmaphyllon Sagraeanum A. Juss. (*S. reticulatum* A. Juss.), Cuba.
TYPE LOCALITY: Baracoa, Cuba, on *Stigmaphyllon periplocifolium*.
DISTRIBUTION: West Indies.
ILLUSTRATIONS: Holway, N. Am. Ured. **1**: *pl. 25, f. 87a, b.*
EXSICCATI: Barth. N. Am. Ured. *42, 1657*.

8. **Bullaria longipes** (Sydow) Arthur & Mains.

Puccinia Euphorbiae longipes Sydow, Ured. *1521*. 1901.

O. Pycnia amphigenous, gregarious, in groups 0.5–1 mm. in diameter on yellowish spots, rather inconspicuous, light-olivaceous becoming light-brown, globoid or flattened-globoid, 58–98 by 58–80 μ; ostiolar filaments agglutinated into a column, 48–55 μ long; pycniospores ellipsoid, 1.5–3 μ, colorless.

II. Uredinia mostly hypophyllous, generally crowded on yellowish or brownish spots 0.2–1 cm. in diameter, oval, 0.2–1 mm. long, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores ellipsoid or obovoid, 18–27 by 28–37 μ; wall consisting of two layers, the inner golden-brown, the outer colorless, 2–3 μ thick, moderately or sparsely echinulate, the pores 6–10, rather indistinct.

III. Telia amphigenous, crowded on discolored areas, oval or oblong, 0.2–1.5 mm. long, early naked, pulverulent, dark chocolate-brown, ruptured epidermis evident; teliospores ellipsoid or oblong-ellipsoid, 21–23 by 48–66 μ, rostriform at apex, rounded below, not constricted at septum; wall dark chestnut-brown, thick, 2.5–4 μ, lighter at apex, golden-brown, 13–20 μ thick, closely and finely verrucose; pedicel colorless below, golden-brown and enlarged next to spore, 10 by 42–65 μ, enlarged at base into a bulbose swelling, 12–16 μ in diameter.

ON EUPHORBIACEAE:
Aklema caracasana (Klotzsch & Garcke) Millsp. (*Euphorbia caracasana* Klotzsch & Garcke), Guatemala.
Aklema cotinifolia (L.) Millsp. (*Euphorbia cotinifolia* L.), Mexico (state), Oaxaca; Guatemala.
TYPE LOCALITY: Oaxaca, Mexico, on *Euphorbia cotinifolia*.
DISTRIBUTION: Southern Mexico and Central America.
EXSICCATI: Barth. Fungi Columb. *2559;* Sydow, Ured. *1521, 2465*.

9. **Bullaria velata** (Ellis & Ev.) Arthur & Mains.

Uredo velata Ellis & Ev. Bull. Torrey Club **22**: 435. 1895.
Puccinia Euphorbiae minor Holway, Bot. Gaz. **24**: 31. 1897.
Puccinia velata Arth. Am. Jour. Bot. **5**: 472. 1918.

O. Pycnia amphigenous, gregarious in groups 0.5–1 mm. in diameter, on yellowish spots, rather inconspicuous, light-brown, flattened-globoid, 58–96 by 39–64 μ; ostiolar filaments agglutinated into a column up to 60 μ long.

II. Uredinia hypophyllous, crowded on yellowish spots 0.4–1 cm. in diameter, or scattered, oval or oblong, 0.5–1.5 mm. long, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores ellipsoid or obovoid, 18–26 by 29–36 μ; wall of two layers, the inner golden-brown, the outer colorless, 1.5–3.5 μ thick, moderately or sparsely echinulate, the pores about 6–8, scattered, rather indistinct.

III. Telia hypophyllous, scattered or crowded on yellowish spots with the uredinia, oval, 0.2–1.5 mm. long, early naked, pulverulent, blackish, ruptured epidermis conspicuous; teliospores ellipsoid, 23–31 by 37–52 μ, acute above, rounded below, not or slightly constricted at septum; wall dark chestnut-brown, 3–5 μ thick, thickened at apex, 5–13 μ, closely verrucose; pedicel colorless in lower portion, golden-brown and enlarged next to spore, 6–7 by 29–48 μ, swollen at base up to 12 μ in diameter.

ON EUPHORBIACEAE:
Aklema ovata (Schlecht.) Millsp. (*Alectoroctonum ovatum* Schlecht., *Euphorbia Schlechtendahlii* Boiss.), Jalisco, Morelos.
Aklema petiolare (Sims) Millsp. (*Euphorbia petiolaris* Sims), Mona Island; St. Thomas.
Aklema Scotana (Schlecht.) Millsp. (*Euphorbia Scotana* Boiss.), Oaxaca, Veracruz; Guatemala.
TYPE LOCALITY: Island of Oahu, Sandwich Islands, on *Euphorbia cordata*.
DISTRIBUTION: Southern Mexico and the West Indies; also in Hawaii.
ILLUSTRATIONS: Holway, N. Am. Ured. 1: *pl. 26, f. 91a, b*.
EXSICCATI: Sydow, Ured. *1871, 1872*.

10. **Bullaria Gouaniae** (Holway) Arthur & Mains.

Puccinia Gouaniae Holway, Ann. Myc. **3**: 21. 1905.

O. Pycnia amphigenous, on yellowish-brown, gall-like hypertrophies 0.5–5 mm. in diamter, light-yellow, punctiform, inconspicuous, globoid, 71–144 μ in diameter; ostiolar filaments 55–96 μ long.

II. Uredinia of the primary form amphigenous, crowded upon gall-like thickenings of the leaf 1–4 mm. across, surrounding the pycnia, oval or oblong, 0.2–0.7 mm. long, early naked, dark cinnamon-brown, somewhat pulverulent, ruptured epidermis evident; paraphyses none; urediniospores obovoid or triangular-obovoid, 21–27 by 26–32 μ; wall cinnamon-brown, 2.5–4 μ thick, sparsely and strongly echinulate, the pores 2, equatorial; secondary uredinia usually hypophyllous, scattered, the sori arising superficially from hyphal masses developing from beneath the epidermis, circular, 0.1–0.3 mm. in diameter, dark cinnamon-brown, pulverulent, ruptured epidermis inconspicuous; paraphyses numerous, peripheral, cylindric or somewhat clavate, incurving, 12–18 by 50–80 μ, usually 1–septate, the wall uniformly thin,

1 μ or less, colorless, smooth; urediniospores obovoid or triangular-obovoid, 21–26 by 24–30 μ; wall dark cinnamon-brown, 1–2.5 μ thick, moderately or closely echinulate, the pores usually 2, equatorial, sometimes 3, superequatorial.

III. Telia not seen; teliospores produced in the uredinia, broadly ellipsoid, 24–32 by 34–45 μ, rounded at both ends, not constricted at septum; wall dark chestnut-brown, uniformly 3–5 μ thick, moderately and rather coarsely verrucose; pedicel colorless or somewhat tinted next to spore, about length of spore, fragile at base.

ON RHAMNACEAE:
Gouania lupuloides (L.) Urban (*G. domingensis* L.), Guatemala; Panama; Cuba; Porto Rico; Santo Domingo.
Gouania polygama (Jacq.) Urban (*G. tomentosa* Jacq.), Costa Rica; Cuba; Porto Rico.
TYPE LOCALITY: Gibara, Cuba, on *Gouania tomentosa*.
DISTRIBUTION: West Indies and Central America; also in South America.
EXSICCATI: Barth. N. Am. Ured. *544*.

11. **Bullaria invaginata** (Arth. & Johnston) Arthur & Mains.

Uredo Gouaniae Ellis & Kelsey, Bull. Torrey Club **24**: 209. 1897. Not *Bullaria Gouaniae* Arth. & Mains, 1922 (above).
Puccinia invaginata Arth. & Johnston, Mem. Torrey Club **17**: 146. 1918.

O. Pycnia unknown.

II. Uredinia hypophyllous, scattered, round or oval, 0.2–0.5 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis inconspicuous; paraphyses peripheral, cylindric or clavate, somewhat incurved, often branching at base, 9–16 by 29–45 μ, the wall colorless, thin, smooth; urediniospores with pore in optical section reniform or obovoid-reniform, 16–19 by 26–31 μ, with pore in surface view obovoid, 19–23 by 26–31 μ; wall light cinnamon-brown, 1.5–2 μ, sparsely or moderately echinulate, only one pore, equatorial on indented or flattened side.

III. Telia amphigenous, scattered, round or oval, 0.2–0.5 mm. across, early naked, pulverulent, dark chocolate- or blackish-brown, ruptured epidermis inconspicuous; teliospores broadly ellipsoid or broadly obovoid, 24–26 by 29–37 μ, rounded at both ends, slightly or not constricted at septum; wall dark chestnut-brown, uniformly 3–4 μ thick, moderately verrucose; pedicel colorless, 20–50 μ long, fragile.

ON RHAMNACEAE:
Gouania lupuloides (L.) Urban (*G. domingensis* L.), Guatemala; Cuba; Porto Rico; St. Croix.
Gouania polygama (Jacq.) Urban (*G. tomentosa* Jacq.), Porto Rico.
TYPE LOCALITY: St. Croix, on *Gouania domingensis*.
DISTRIBUTION: West Indies and Guatemala; also in South America.

12. **Bullaria (?) Psidii** (Wint.) Arthur & Mains.

Puccinia Psidii Wint. Hedwigia **23**: 171. 1884.
Uredo flavidula Wint. Hedwigia **24**: 260. 1885.
Uredo Myrtacearum Paz. Hedwigia **29**: 159. 1890.
Uredo Eugeniarum P. Henn. Hedwigia **34**: 337. 1895.
Puccinia Jambosae P. Henn. Hedwigia **41**: 105. 1902.
Uredo Myrciae Mayor, Mém. Soc. Neuch. Sci. Nat. **5**: 590. 1913.
Puccinia jambulana Rangel; Averna-Saccá, Bol. Agr. São Paulo **21**: 37. 1920.

O. Pycnia unknown.

II. Uredinia usually hypophyllous, crowded in round, brown, discolored areas 1–12 mm. across, oval or oblong, 0.1–1 mm. long, somewhat tardily naked, pulverulent, pale brownish-yellow, ruptured epidermis conspicuous; urediniospores ellipsoid or obovoid, 15–19 by 20–27 μ; wall colorless or pale-yellow, 1.5–2.5 μ thick, closely or moderately echinulate, the pores obscure.

III. Telia not seen; teliospores in uredinia, ellipsoid or obovoid, 16–23 by 27–45 μ, rounded above, narrowed or rounded below, slightly constricted at septum, germinating at maturity; wall pale cinnamon-brown, uniformly 1–1.5 μ, smooth; pedicel deciduous.

ON MYRTACEAE:
Jambosa Jambos (L.) Millsp. (*J. vulgaris* DC., *Eugenia Jambos* L.), Cuba; Porto Rico.
Psidium Guajana L., Porto Rico.
TYPE LOCALITY: São Francisco, Prov. St. Catharina, Brazil, on *Psidium pomiferum*.
DISTRIBUTION: West Indies; also in South America.
ILLUSTRATIONS: Mém. Soc. Neuchât. **5**: 590, *f. 96;* Bol. Agr. São Paulo **21**: 39, *f. 1*.

13. **Bullaria Hydrocotyles** (Link) Arthur & Mains.

Caeoma Hydrocotyles Link, in Willd. Sp. Pl. 6²: 22. 1825.
Uredo Hydrocotyles Bertero; Mont. Ann. Sci. Nat. II. 3: 356. 1835.
Trichobasis Hydrocotyles Cooke, Jour. Bot. 2: 343. 1864.
Uredo bonariensis Speg. Anal. Soc. Ci. Argent. 9: 171. 1880.
Puccinia Hydrocotyles Cooke, Grevillea 9: 14. 1880.
Aecidiolum Hydrocotyles Speg. Anal. Soc. Ci. Argent. 12: 80. 1881.

O. Pycnia unknown.

II. Uredinia amphigenous, chiefly epiphyllous, numerous, scattered or confluent in small groups, round or oval, 0.2–0.7 mm. across, rather early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores globoid or broadly ellipsoid, 19–27 by 24–32 μ; wall cinnamon-brown, 1.5–2.5 μ thick, closely or moderately and sharply echinulate, the pores 2, equatorial or slightly superequatorial.

III. Telia amphigenous, rare, scattered, round, 0.3–0.8 mm. across, early naked, pulverulent, chestnut-brown, surrounding epidermis noticeable; teliospores broadly ellipsoid or oblong, 19–26 by 30–42 μ, rounded at both ends, slightly constricted at septum; wall cinnamon-brown, 2–3 μ thick, not or only slightly thickened at apex, smooth, the pore of the upper cell at or slightly below apex, of the lower cell half way between septum and hilum; pedicel colorless, fragile, short, sometimes inserted laterally.

ON AMMIACEAE:
Hydrocotyle australis Coult. & Rose, Cuba; Porto Rico.
Hydrocotyle bonariensis Lam., South Carolina; Mexico (state); Guatemala.
Hydrocotyle Canbyi Coult. & Rose, Maryland.
Hydrocotyle mexicana Cham. & Schlecht., Oaxaca; Costa Rica; Guatemala.
Hydrocotyle prolifera Kellogg, Arizona, California.
Hydrocotyle ranunculoides L.f., Nevada; Bermuda.
Hydrocotyle umbellata L., Alabama, Florida, Texas; Costa Rica; Porto Rico.
Hydrocotyle verticillata Thunb., Louisiana, Mississippi, Nevada; Bermuda.
Hydrocotyle sp., Morelos.

TYPE LOCALITY: Near Rio de Janeiro, Brazil, on *Hydrocotyle* sp.

DISTRIBUTION: Maryland, Texas, and central California southward through Central America and the West Indies; Bermuda; also in Hawaii, New Zealand, South America, and Europe.

ILLUSTRATIONS: Holway, N. Am. Ured. 1: *pl. 37, f. 122a, b;* Grove, Brit. Rust Fungi *f. 130.*

EXSICCATI: Barth. N. Am. Ured. *548, 1764;* Ellis, N. Am. Fungi *1482;* Seym. & Earle, Econ. Fungi Suppl. *B12.*

14. **Bullaria Ziziae** (Ellis & Ev.) Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.

Puccinia Ziziae Ellis & Ev. Bull. Torrey Club 22: 60. 1895.

O. Pycnia unknown.

II. Uredinia unknown; urediniospores present in the telia, ellipsoid, 22–27 by 30–35 μ; wall light cinnamon-brown, 2–2.5 μ thick, thickened at apex and often at base, 4–7 μ, moderately echinulate, the pores 3, approximately equatorial.

III. Telia mostly epiphyllous, scattered, round or oval, 0.2–0.8 mm. across, early naked, becoming pulverulent, dark cinnamon- or chestnut-brown, ruptured epidermis evident; teliospores somewhat irregularly oblong, oblong-clavate, or ellipsoid, 16–22 by 29–45 μ, rounded above, rounded or somewhat narrowed below, slightly constricted at septum; wall cinnamon-brown, rather thin, 1–1.5 μ, sometimes somewhat thickened at apex into a low papilla up to 3 μ thick, smooth, or occasionally with a few irregular longitudinal ridges, the pore of the upper cell at apex, of the lower cell at or near septum; pedicel colorless, fragile, up to half length of spore.

ON AMMIACEAE:
Zizia cordata Koch, Washington.
TYPE LOCALITY: Pullman, Washington, on *Zizia cordata.*
DISTRIBUTION: Known only from the type locality.

15. **Bullaria Coelopleuri** (Arth.) Arthur & Mains.

Puccinia Coelopleuri Arth. Bull. Torrey Club 46: 116. 1919.

O. Pycnia amphigenous or petiolicolous, crowded in groups 1–2 mm. in diameter, noticeable, chestnut- or chocolate-brown, globoid, 96–112 μ in diameter; ostiolar filaments not projecting much above the ostiole, 48–64 μ long.

II. Uredinia amphigenous; primary uredinia sometimes petiolicolous, crowded, circinating about the pycnia in round or oblong groups 2–10 mm. long, oblong, 0.5–4 mm. long, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; secondary uredinia scattered over the leaves unaccompanied by pycnia, oval, 0.2–0.5 mm. long, otherwise like the primary form; urediniospores of both forms broadly obovoid or ellipsoid, 22–26 by 27–35 μ; wall cinnamon-brown, 2–2.5 μ thick, much thicker above, 3–7 μ, moderately echinulate, the pores 3, equatorial, covered by the colorless swollen cuticle.

III. Telia mostly hypophyllous, scattered, oval, 0.2–0.5 mm. long, early naked, somewhat pulverulent, chocolate-brown, ruptured epidermis evident; teliospores cylindric, oblong, or oblong-clavate, 15–20 by 37–63 μ, rounded above and below, or slightly narrowed below, not or slightly constricted at septum; wall dark cinnamon-brown, thin, 1–2 μ, slightly thickened at apex, 3–4 μ, smooth, the pore in upper cell at apex, in lower cell rather variable, 1/3 to 5/6 down in the cell; pedicel colorless, fragile.

ON AMMIACEAE:
Coelopleurum Gmelini (DC.) Ledeb., Alaska.
TYPE LOCALITY: Mendenhall, Alaska, on *Coelopleurum Gmelini*.
DISTRIBUTION: Southeastern Alaska.

16. **Bullaria bullata** (Pers.) Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.

Uredo bullata Pers. Ann. Bot. Usteri **15**: 37. 1795.
Uredo Angelicae Schum. Enum. Pl. Saell. **2**: 233. 1803.
Bullaria Umbelliferarum DC. Fl. Fr. **2**: 226. 1805.
Uredo Athamanthae DC. Fl. Fr. **2**: 228. 1805.
Puccinia Umbelliferarum DC. Fl. Fr. **6**: 58. 1815.
Stilbospora bullata Link, Ges. Nat. Freunde Berlin Mag. **7**: 30. 1815.
Caeoma Athamantharum Link; Willd. Sp. Pl. 6^2: 22. 1825.
Puccinia Bullaria Link, in Willd. Sp. Pl. 6^2: 78. 1825.
Puccinia Angelicae Fuckel, Jahrb. Nass. Ver. Nat. **23–24**: 52. 1870.
Puccinia Silai Fuckel, Jahrb. Nass. Ver. Nat. **23–24**: 53. 1870.
Puccinia bullata Schroet. Beitr. Biol. Pfl. **3**: 74. 1879. Not *P. bullata* Link 1815, nor *P. bullata* Schw. 1822.
Puccinia Archangelicae A. Blytt, For. Vid.-Selsk. Christ. 1896^6: 51. 1896.
Dicaeoma bullatum Kuntze, Rev. Gen. 3^3: 468. 1898.
Puccinia Cervariae Lindr. Medd. Stockh. Högsk. Bot. Inst. 4^9: 3. 1901.
Puccinia Athamanthae Lindr. Acta Soc. Faun. Fl. Fenn. 22^1: 101. 1902.
Bullaria Angelicae Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.

O. Pycnia amphigenous, crowded in small groups 1–2 mm. across, noticeable, dark-brown, flattened-globoid, 96–128 by 71–80 μ; ostiolar filaments 80–90 μ long.

II. Uredinia of the primary form circinating about the pycnia in groups 3–6 mm. across, otherwise the same as the secondary form; secondary uredinia mostly hypophyllous, round or oval, 0.2–1 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis evident; urediniospores of both forms broadly obovoid or ellipsoid, 19–29 by 27–39 μ; wall pale cinnamon- or golden-brown, 1.5–4 μ thick, thickened at apex, 3–10 μ, moderately echinulate, the pores 3, rarely 4, equatorial, covered by the more or less swollen cuticle.

III. Telia mostly hypophyllous, scattered, round or oval, 0.2–0.6 mm. across, early naked, pulverulent, chocolate-brown, ruptured epidermis evident; teliospores ellipsoid or oblong, sometimes irregularly so, 19–27 by 30–50 μ, rounded above and below, slightly constricted at septum; wall dark cinnamon- or chestnut-brown, 2–3.5 μ thick, sometimes slightly thickened at apex up to 4 μ, smooth, the pore of the upper cell usually at apex, of the lower variable, usually in lower half of the cell; pedicel colorless, fragile.

ON AMMIACEAE:
Angelica atropurpurea L., New York.
Angelica genuflexa Nutt., Washington.
Angelica Lyallii S. Wats., Oregon.
Angelica villosa (Walt.) B. S. P., Pennsylvania.
Taenidia integerrima (L.) Drude (*Zizia integerrima* DC., *Pimpinella integerrima* A. Gray), Indiana, Michigan, New York, Wisconsin.
Zizia aurea (L.) Koch, Manitoba.
TYPE LOCALITY: Europe, on stems of some umbelliferous plant.
DISTRIBUTION: Northern border of the United States and northward; also in Europe and Asia.
ILLUSTRATIONS: Beitr. Krypt. Schweiz 2^2: *f. 90, 91, 92;* Holway, N. Am. Ured. **1**: *pl. 41, f. 133a, b, 134a, b.*
EXSICCATI: Barth. Fungi Columb. *4955;* Barth. N. Am. Ured. *621, 814, 1429;* Ellis & Ev. Fungi Columb. *1771.*

17. **Bullaria (?) Prionosciadii** (Lindr.) Arthur & Mains.

Puccinia Prionosciadii Lindr. Medd. Stockh. Högsk. Bot. Inst. **4**[9]: 5. 1901.
Puccinia Coulterophyti Dietel & Holway; Holway, Bot. Gaz. **31**: 335. 1901.

O. Pycnia unknown.

II. Uredinia hypophyllous, scattered, oval or oblong, 0.1–0.3 mm. long, early naked, pulverulent, pale-yellow, ruptured epidermis evident; urediniospores broadly ellipsoid or obovoid, 18–32 by 24–42 μ; wall colorless, 1–1.5 μ, gradually thickening from about the equator of the spore up to 5–18 μ at apex, sparsely or moderately echinulate, the pores rather indistinct, 2 or 3, equatorial.

III. Telia hypophyllous, scattered, oval or oblong, 0.1–0.3 mm. long, early naked, compact or somewhat pulverulent, brownish-black, ruptured epidermis evident; teliospores broadly ellipsoid, 23–35 by 35–60 μ, rounded at both ends, somewhat constricted at septum; wall light chestnut-brown, 3–5 μ thick, thickened at apex, 5–12 μ, closely and inconspicuously verrucose-rugose, often appearing smooth when wet, the pore in the upper cell apical, in the lower at or near septum; pedicel colorless, fragile, in some collections persistent, 60–80 μ long.

ON AMMIACEAE:
Coulterophytum Holwayi Rose, Jalisco, Michoacan.
Coulterophytum laxum B. L. Robinson, Jalisco.
Prionosciadium dissectum Coult. & Rose, Jalisco.
Prionosciadium linearifolium Coult. & Rose, Jalisco.
Prionosciadium Nelsoni Coult. & Rose, Mexico (state), Morelos.
Prionosciadium serratum Coult. & Rose, Jalisco.
Prionosciadium Watsoni Coult. & Rose, Jalisco.
TYPE LOCALITY: [Jalisco], Mexico, on *Prionosciadium Watsoni.*
DISTRIBUTION: Southern Mexico.
ILLUSTRATIONS: Holway, N. Am. Ured. **1**: *pl. 43, f. 139a, b, c, d.*
EXSICCATI: Barth. Fungi Columb. *3463, 3859;* Barth. N. Am. Ured. *55, 258, 466, 1567;* Sydow, Ured. *1827.*

18. **Bullaria Cynomarathri** (Holway) Arthur & Mains.

Puccinia Cynomarathri Holway, N. Am. Ured. 1: 94. 1913.

O. Pycnia epiphyllous, crowded in groups 1–3 mm. across, conspicuous, honey-yellow or brownish-black, globoid, 90–100 by 93–112 μ; ostiolar filaments 70–80 μ long.

II. Uredinia of the primary form crowded in a confluent circinating group around the pycnia, 2–5 mm. long, 0.6–0.8 mm. wide, otherwise similar to the secondary form; secondary uredinia amphigenous, scattered, oval, 0.8–1 mm. long, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores of both forms broadly ellipsoid or obovoid, 19–27 by 29–35 μ; wall cinnamon-brown, rather thick, 2–2.5 μ, sometimes slightly thickened at apex and base, 3–4 μ, moderately echinulate, the pores usually 3, equatorial, prominent, covered by the swollen colorless cuticle.

III. Telia amphigenous, scattered, oval or linear, 0.5–2 mm. long, early naked, pulverulent, dark chocolate-brown, ruptured epidermis conspicuous; teliospores oblong or ellipsoid, 22–26 by 37–48 μ, rounded above and below, or somewhat narrowed below, slightly constricted at septum; wall light chestnut- or dark cinnamon-brown, 1.5–2.5 μ thick, sometimes slightly thickened at apex, closely and rather prominently verrucose, the pore of the upper cell at apex, of the lower at septum; pedicel colorless, fragile.

ON AMMIACEAE:
Cynomarathrum Nuttallii (A. Gray) Coult. & Rose (*Peucedanum graveolens* S. Wats.), Utah.
TYPE LOCALITY: Wasatch Mountains, Wasatch County, Utah, on *Cynomarathrum Nuttallii.*
DISTRIBUTION: Wasatch Mountains, Utah.
ILLUSTRATIONS: Holway, N. Am. Ured. **1**: *pl. 44, f. 142a, b.*
EXSICCATI: Garrett, Fungi Utah. *9, 51.*

19. **Bullaria (?) Ellisii** (De-Toni) Arthur & Mains.

Puccinia Angelicae Ellis & Ev. Bull. Washb. Lab. Nat. Hist. **1**: 3. 1884. Not *P. Angelicae* Fuckel, 1870.
Puccinia Ellisii De-Toni, in Sacc. Syll. Fung. **7**: 651. 1888.
Puccinia Bakeriana Arth. Bull. Torrey Club **31**: 3. 1904.

O. Pycnia unknown.

II. Uredinia hypophyllous, scattered, round, 0.2–0.4 mm. in diameter, early naked,

pulverulent, cinnamon-brown, ruptured epidermis evident; urediniospores broadly ellipsoid, 26–35 by 35–43 μ; wall cinnamon-brown, 2–4 μ thick, thickened 5–9 μ at apex and hilum, moderately echinulate, the pores 3 or 4, equatorial.

III. Telia amphigenous, scattered, round or oval, 0.3–1 mm. across, early naked, slightly pulverulent, chocolate-brown, ruptured epidermis evident; teliospores ellipsoid or obovoid, 22–29 by 35–45 μ, rounded above and below, somewhat constricted at septum; wall chestnut-brown, rather uniformly 1.5–3 μ thick, moderately or closely and finely verrucose, the pore of the upper cell at apex, of the lower at septum; pedicel colorless, fragile.

ON AMMIACEAE:
Angelica Breweri A. Gray, California.
Angelica genuflexa Nutt., Idaho, Oregon, Washington.
Angelica tomentosa S. Wats., California.
TYPE LOCALITY: Falcon Valley, Washington, on *Angelica genuflexa*.
DISTRIBUTION: Mountains of Washington and Idaho to central California.
ILLUSTRATIONS: Holway, N. Am. Ured. 1: *pl. 41, f. 135a, b.*
EXSICCATI: Ellis, N. Am. Fungi *1449*.

20. **Bullaria Vincae** (DC.) Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.

Uredo Vincae DC. Fl. Fr. **6**: 70. 1815.
Caeoma Vincae Link, in Willd. Sp. Pl. **6**^{2}: 14. 1825.
Erysibe pustulata Vincae Wallr. Fl. Crypt. Germ. **2**: 198. 1833.
Puccinia Vincae Berk. in Smith Engl. Fl. **5**^{2}: 364. 1836.
Trichobasis Vincae Berk.; Cooke, Micr. Fungi 210. 1865.
Puccinia Berkeleyi Pass.; Rab. Fungi Eur. *1686*. 1873.

O. Pycnia hypophyllous, numerous, scattered over a large portion of the leaf, conspicuous, light-brown or chestnut-brown, hemispheric, 176–222 by 112–128 μ; ostiolar filaments 144–176 μ long.

II. Uredinia hypophyllous, numerous, scattered among the pycnia, oval or oblong, 0.5–1.5 mm. long, early naked, pulverulent, dark cinnamon-brown, ruptured epidermis conspicuous; urediniospores ellipsoid, 19–26 by 26–44 μ; wall cinnamon- or golden-brown, 2–2.5 μ thick, moderately and faintly echinulate, the pores 3 or 4, equatorial.

III. Telia amphigenous, mostly hypophyllous, scattered, oval or oblong, 0.6–1.2 mm. long, early naked, somewhat pulverulent, chestnut-brown, ruptured epidermis conspicuous; teliospores ellipsoid or oblong, 19–26 by 32–47 μ, rounded or somewhat narrowed at both ends, not or slightly constricted at septum; wall dark cinnamon- or chestnut-brown, 1.5–2.5 μ thick, thickened into a lighter colored umbo at apex, 5–7 μ, closely and finely verrucose in more or less evident longitudinal lines; pedicel colorless, short, fragile.

ON APOCYNACEAE:
Vinca major L., Massachusetts, Michigan.
TYPE LOCALITY: France.
DISTRIBUTION: Rare in greenhouses of Massachusetts and Michigan; also in Europe.
ILLUSTRATION: Grove, Brit. Rust Fungi *f. 127*.
EXSICCATI: Barth. Fungi Columb. *3834*.

21. **Bullaria Cordiae** (P. Henn.) Arthur & Mains.

Uredo Cordiae P. Henn. Hedwigia **43**: 163. 1904.
Puccinia Cordiae Arth. Mycologia **8**: 17. 1916.

O. Pycnia amphigenous and caulicolous, grouped in areas 1–2 mm. in diameter or scattered over the more or less deformed terminal leaves of infected shoots, conspicuous, dark-brown, globoid, 80–144 μ in diameter; ostiolar filaments forming a prominent agglutinated column up to 144 μ long.

II. Uredinia of the primary form mostly hypophyllous, causing hypertrophy, associated with the pycnia, round, 0.2–0.4 mm. across, early naked, pulverulent, dark cinnamon-brown, ruptured epidermis evident; paraphyses few or none; urediniospores ellipsoid, 15–23 by 28–32 μ; wall light cinnamon-brown, 1.5–2 μ thick, usually thickened above, 4–7 μ, closely verrucose, the pores probably 3 or 4, equatorial, rather indistinct; secondary uredinia scattered; paraphyses peripheral, hyphoid, 10–18 by 45–75 μ, the wall colorless, smooth, thin, 1 μ; urediniospores 21–26 by 29–35 μ; wall 1.5–2 μ thick, thickened at apex, 5–12 μ, otherwise similar to the primary form.

III. Telia amphigenous, scattered, round, 0.2–0.4 mm. across, early naked, chestnut-brown, ruptured epidermis evident; paraphyses as in the secondary uredinia; teliospores ellipsoid, 19–26 by 37–55 μ, rounded at both ends, not constricted at septum; wall dark chestnut-brown, uniform in thickness, 2.5–3 μ, very coarsely and sparsely conically verrucose, especially above; pedicel colorless, 6–9 by 30–40 μ, in water swelling near base up to 20 μ in diameter.

ON EHRETIACEAE:
Gerascanthus alliodorus R. & S. (*Cordia alliodora* Cham.), Guatemala; Porto Rico.
TYPE LOCALITY: Tarapoto, Peru, on *Cordia* sp.
DISTRIBUTION: Rare in Guatemala and Porto Rico; also in South America.

22. **Bullaria elatipes** (Arth. & Holway) Arthur & Mains.

Puccinia elatipes Arth. & Holway; Arth. Mycologia 10: 133. 1918.

O. Pycnia epiphyllous, few, crowded on discolored spots 1–1.5 mm. in diameter, conspicuous, cinnamon- or chocolate-brown, flattened-conic, 190–238 by 74–144 μ.

II. Uredinia amphigenous, crowded on spots with the pycnia, round or oval, 0.2–0.4 mm. in diameter, early naked, pulverulent, cinnamon-brown, ruptured epidermis inconspicuous; urediniospores with the pores in optical section appearing triangular, 26–29 by 26–29 μ, with the pores in surface view obovate, 23–25 μ wide, seen from above elliptic; wall cinnamon-brown, 1.5 μ thick, rather sparsely and strongly echinulate, the pores 2, approximately equatorial.

III. Telia mostly hypophyllous, scattered, circular, 0.1–0.5 mm. in diameter, early naked, somewhat pulverulent, pulvinate, chestnut-brown, ruptured epidermis inconspicuous; teliospores ellipsoid, 23–26 by 39–45 μ, rounded at both ends, constricted at septum; wall cinnamon-brown, thin, 1 μ, thickened by a colorless umbo at apex, 3–6 μ, smooth; pedicel colorless, 18–24 by 103–151 μ, cylindric or fusiform-cylindric, thin-walled.

ON VERBENACEAE:
Lippia myriocephala Schlecht. & Cham., Guatemala.
Lippia sp., Costa Rica.
TYPE LOCALITY: Road from Quezaltenango to Colomba, Guatemala, on *Lippia myriocephala*.
DISTRIBUTION: Central America.

23. **Bullaria impedita** (Mains & Holway) Arthur & Mains.

Puccinia impedita Mains & Holway; Arth. Mycologia **10**: 135. 1918.

O. Pycnia epiphyllous, crowded in small groups with the uredinia, noticeable, chestnut-brown, globoid or flask-shaped, 74–109 μ wide by 80–112 μ high; ostiolar filaments 60–80 μ long, not projecting much beyond the ostiole.

II. Uredinia of the primary form crowded about the pycnia in small groups 1–3 mm. in diameter, otherwise same as the secondary form; secondary uredinia usually hypophyllous, scattered, round, 0.1–0.5 mm. in diameter, early naked, pulverulent, cinnamon-brown, ruptured epidermis evident; urediniospores of both forms oblate-spheroid, 18–23 by 16–19 μ, or globoid or obovoid, 16–23 by 17–23 μ; wall cinnamon-brown, 1–1.5 μ, moderately or closely echinulate, the pores 2 or 3, approximately equatorial or subequatorial.

III. Telia hypophyllous or caulicolous, scattered on the leaves, round, 0.2–0.4 mm. in diameter, on the stems in large patches 2–12 mm. long, early naked, pulvinate at first, becoming pulverulent, brownish-black, ruptured epidermis inconspicuous; teliospores broadly ellipsoid, 24–32 by 30–49 μ, rounded above and below, not constricted at septum; wall dark chestnut- or chocolate-brown, thick, 3–5 μ, in some collections not thicker than 3.5 μ, thickened over pores into a yellowish umbo, 5–9 μ, very finely and inconspicuously verrucose; pedicel long, up to 160 μ, usually thick-walled, 1.5–2.5 μ.

ON LAMIACEAE:
Salvia assurgens H.B.K., Michoacan.
Salvia coccinea Juss., Porto Rico.
Salvia hyptoides Mart. & Gal., Costa Rica.
Salvia occidentalis Sw., Costa Rica; Guatemala; Cuba; Jamaica; Porto Rico; St. Croix.
Salvia tiliaefolia Vahl, Jalisco, Morelos; Costa Rica.
TYPE LOCALITY: San José, Costa Rica, on *Salvia hyptoides*.
DISTRIBUTION: Southern Mexico southward through Costa Rica, and in the West Indies; also in South America.

24. **Bullaria parilis** (Arth.) Arthur & Mains.

Argomyces parilis Arth. N. Am. Flora **7**: 217. 1912.
Puccinia parilis Arth. Am. Jour. Bot. **5**: 485. 1918.

O. Pycnia epiphyllous, few in small groups on discolored spots 1 or 2 mm. across, or scattered among the uredinia, inconspicuous, globoid, 130–160 μ in diameter.

II. Uredinia hypophyllous, scattered, round, 0.1–0.4 mm. across, early naked, very pulverulent, chestnut-brown, ruptured epidermis inconspicuous; urediniospores globoid, or less often broadly ellipsoid, 19–24 by 20–30 μ, usually 20–23 μ in diameter; wall dark cinnamon-brown, concolorous, moderately thick, 1.5–3 μ, strongly and evenly echinulate with points about 2 μ apart, the pores 2 or 3 near hilum, not very distinct.

III. Telia hypophyllous, scattered, abundant, round, small, 0.1–0.3 mm. across, early naked, pulvinate, white, ruptured epidermis inconspicuous; teliospores oblong or lance-oblong, 16–20 by 35–50 μ, narrowed or obtuse at both ends, slightly constricted at septum; wall smooth, nearly or quite colorless, uniformly thin, about 1 μ; pedicel colorless, terete, delicate, one half to once length of spore.

ON LAMIACEAE:
Hyptis pectinata (L.), Poir. (*Mesosphaerum pectinatum* Kuntze), Jalisco, Morelos, Oaxaca.
Hyptis stellulata Benth. (*Mesosphaerum stellulatum* Kuntze), Guatemala.
TYPE LOCALITY: Oaxaca, Mexico, on *Hyptis pectinata*.
DISTRIBUTION: Southern Mexico and Guatemala.
EXSICCATI: Barth. N. Am. Ured. *641*.

25. **Bullaria adducta** (Arth.) Arthur & Mains.

Puccinia adducta Arth. Bull. Torrey Club **45**: 148. 1918.

O. Pycnia epiphyllous, few, on yellow spots surrounded by a purplish zone in groups 1–3 mm. in diameter, noticeable, chestnut-brown, globoid, 80–105 μ in diameter; ostiolar filaments not seen.

II. Uredinia of the primary form opposite the pycnia on large yellowish spots 2–5 mm. across, otherwise similar to the secondary form; secondary uredinia hypophyllous, scattered, round, minute, up to 0.5 mm. in diameter, early naked, dull chestnut-brown, ruptured epidermis evident; urediniospores of both forms irregularly obovoid, 19–23 by 27–35 μ; wall cinnamon-brown or paler, 1–2 μ thick, moderately and strongly echinulate, the pores probably 3, equatorial, indistinct.

III. Telia hypophyllous, following the uredinia, usually round, dull chestnut-brown, ruptured epidermis evident; teliospores ellipsoid or oblong, 19–26 by 35–45 μ, rounded or slightly tapering at both ends, slightly or not constricted at septum; wall cinnamon-brown, about 1.5 μ thick, usually with a slight papilla-like thickening at apex, smooth; pedicel short, rather thick, often deciduous.

ON SOLANACEAE:
Solanum racemosum Jacq., Antigua.
TYPE LOCALITY: Antigua, West Indies, on *Solanum racemosum*.
DISTRIBUTION: Known only from the type locality.

26. **Bullaria globosipes** (Peck) H. S. Jackson, Proc. Ind. Acad. Sci. **1915**: 437. 1916.

Puccinia globosipes Peck, Bull. Torrey Club **12**: 34. 1885.
Uredo similis Ellis, Jour. Myc. **7**: 275. 1898.
Dicaeoma globosipes Kuntze, Rev. Gen. **3**^{3}: 469. 1898.
Uredo inquirenda Arth. Bull. Torrey Club **34**: 592. 1907.

O. Pycnia unknown.

II. Uredinia amphigenous, scattered or crowded in irregular indefinite groups, round or elliptic, 0.5–1.2 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores ellipsoid or oblong-obovoid, 16–26 by 27–48 μ; wall cinnamon-brown, 1.5–2.5 μ thick, sometimes thickened at apex, 2–3 μ, closely echinulate above, inconspicuously echinulate or smooth below, the pores 8, in two transverse bands of 4 each, the upper band superequatorial or occasionally equatorial, the lower subequatorial.

III. Telia amphigenous, scattered, round or elliptic, 0.3–1.2 mm. across, early naked,

pulverulent, brownish-black, ruptured epidermis noticeable; teliospores broadly ellipsoid or globoid, 29–39 by 33–50 μ, rounded above and below, not or slightly constricted at septum; wall chocolate- or dark chestnut-brown, thick, 3–5 μ, sometimes slightly thickened at apex, 4–7 μ, moderately or sparsely verrucose, with colorless or semihyaline markings 1.5–2 μ broad by 2–2.5 μ high; pedicel colorless, short, globoid in water, 37–48 μ in diameter.

ON SOLANACEAE:
Lycium Andersonii A. Gray, California, Nevada, Utah.
Lycium californicum Nutt., California.
Lycium carolinianum Walt., Cuba.
Lycium cedrosense Greene, Lower California.
Lycium Fremontii A. Gray, Arizona.
Lycium gracilipes A. Gray, Arizona, California.
Lycium halimifolium Mill. (*L. vulgare* Dunal), Alabama, Indiana, Mississippi, Pennsylvania, Texas.
Lycium Torreyi A. Gray, Arizona, Utah.
TYPE LOCALITY: California, on *Lycium californicum*.
DISTRIBUTION: Southern Pennsylvania to central Indiana and central California, and southward to the Mexican border and Cuba.
ILLUSTRATIONS: Bull. Torrey Club **12**: *pl. 49, f. 9, 10*.
EXSICCATI: D. Griff. W. Am. Fungi *284, 285*.

27. **Bullaria tumidipes** (Peck) Arth. Mycologia **8**: 136. 1916.

Puccinia tumidipes Peck, Bull. Torrey Club **12**: 34! 1885.
Dicaeoma tumidipes Kuntze, Rev. Gen. **3**^{3}: 471. 1898.

O. Pycnia epiphyllous, in small groups, honey-yellow, becoming brownish, globoid or conic, 70–80 μ in diameter; ostiolar filaments 30–40 μ long.

II. Uredinia of the primary form grouped about the pycnia, otherwise similar to the secondary form; secondary uredinia amphigenous, scattered, round or elliptic, 0.3–1 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores of both forms oblong, oblong-ellipsoid, or oblong-obovoid, 16–25 by 27–42 μ; wall cinnamon-brown, 1.5–2.5 μ thick, closely and rather prominently echinulate above, less conspicuously so or smooth below, the pores 8, in two transverse bands of 4 each, the upper superequatorial or sometimes equatorial, the lower subequatorial.

III. Telia amphigenous, scattered or somewhat crowded, round or ellipsoid, 0.8–1.5 mm. across, early naked, pulverulent, brownish-black, ruptured epidermis noticeable; teliospores ellipsoid or oblong-ellipsoid, 23–30 by 37–55 μ, rounded or slightly narrowed above and below, not or only slightly constricted at septum; wall dark chestnut- or chocolate-brown, thick, 2.5–4 μ, thickened at apex, 5–7 μ, closely and finely verrucose, often appearing smooth when wet; pedicel colorless, inflated, fusiform-oblong, 27–39 μ broad, 65–96 μ long.

ON SOLANACEAE:
Lycium halimifolium Mill. (*L. vulgare* Dunal), Iowa, Kansas, Nebraska.
Lycium pallidum Miers, Arizona, Colorado, New Mexico, Texas, Utah.
Lycium parviflorum A. Gray, Arizona.
Lycium Torreyi A. Gray, Arizona, New Mexico.
TYPE LOCALITY: Arizona, on *Lycium Andersoni*, error for *L. pallidum*.
DISTRIBUTION: Kansas to Texas, and westward to Utah and Arizona.
ILLUSTRATIONS: Bull. Torrey Club **12**: *pl. 49, f. 3–8*.
EXSICCATI: Barth. N. Am. Ured. *66, 67, 271, 272, 2172, 2371, 2566, 2567;* Ellis & Ev. Fungi Columb. *1765, 1857;* Garrett, Fungi Utah, *223*.

28. **Bullaria vacua** (Dietel & Holway) Arthur & Mains.

Puccinia vacua Dietel & Holway; Holway, Bot. Gaz. **24**: 30. 1897.

O. Pycnia amphigenous, fairly numerous on yellowish or purplish spots with the uredinia, small, punctiform, noticeable, honey-yellow becoming cinnamon-brown, flattened-conic, 130–160 μ wide by 65–76 μ high; ostiolar filaments short.

II. Uredinia of the primary form epiphyllous, circinating about the pycnia in groups 0.4–1 mm. in diameter, otherwise similar to the secondary form; secondary uredinia hypophyllous, scattered, round or ellipsoid, 0.1–0.4 mm. across, tardily naked, pulverulent, pale-yellow, ruptured epidermis conspicuous; urediniospores of both forms broadly ellipsoid or globoid, 20–26 by 22–29 μ; wall pale-yellow or colorless, 2–3 μ thick, moderately and prominently echinulate, the pores 3 or 4, equatorial, rather indistinct.

III. Telia mostly hypophyllous, scattered, usually along the leaf's edge, round, small, 0.1–0.4 mm. across, early naked, pulvinate, becoming somewhat pulverulent, chestnut-brown, ruptured epidermis inconspicuous; teliospores ellipsoid, 19–27 by 42–48 μ, rounded above, rounded or slightly narrowed below, slightly constricted at septum, germinating at maturity; wall cinnamon- or light chestnut-brown, 1–2 μ thick, thickening gradually toward apex, up to 5–7 μ, very faintly and minutely reticulate, often appearing smooth; pedicel hyaline, up to 80 μ long, fragile.

ON LOBELIACEAE:
Lobelia sp., Morelos.
TYPE LOCALITY: Cuernavaca, Mexico, on *Lobelia* sp.
DISTRIBUTION: Known only from the type locality.

29. **Bullaria insulana** (Arth.) Arthur & Mains.

Argomyces insulanus Arth. Mycologia **7**: 179. 1915.
Puccinia insulana H. S. Jackson, Bot. Gaz. **65**: 296. 1918.

O. Pycnia epiphyllous, few in crowded groups, globoid-flask-shaped, 105–175 by 170–200μ.

II. Uredinia of the primary form surrounding the pycnia, somewhat confluent; urediniospores slightly larger than in secondary uredinia, otherwise similar to the secondary form; secondary uredinia hypophyllous, few, scattered, round or oblong, small, 0.3–0.5 mm. long, early naked, pulverulent, dull cinnamon-brown, ruptured epidermis evident; urediniospores of both forms ellipsoid or obovoid, 19–26 by 26–35 μ; wall cinnamon-brown, moderately echinulate, 1.5–2.5 μ thick, the pores usually 3, equatorial or slightly subequatorial, indistinct.

III. Telia hypophyllous, few, usually scattered, round or oblong, 0.3–0.8 mm. long, early naked, dull cinnamon-brown, germinating at maturity, ruptured epidermis evident; teliospores broadly ellipsoid or ellipsoid-fusiform, 19–30 by 42–60 μ, obtuse, or somewhat attenuate at both ends, slightly constricted at septum; wall pale cinnamon-brown, thin, 1–1.5 μ, with a low hyaline papilla over the pore disappearing at germination, smooth, the pore in lower cell near septum; pedicel colorless, once length of spore or less.

ON CARDUACEAE:
Vernonia albicaulis Pers., Porto Rico; St. Croix.
Vernonia arborescens (L.) Sw. (*V. divaricata* Sw.), Jamaica.
Vernonia longifolia Pers., Porto Rico; Antigua.
Vernonia sp., Guatemala.
TYPE LOCALITY: [Dos Bocas], river junction below Utuado, Porto Rico, on *Vernonia albicaulis*.
DISTRIBUTION: Guatemala and the West Indies.

30. **Bullaria Arthuriana** (H. S. Jackson) Arthur & Mains.

Argomyces Vernoniae Arth. N. Am. Flora **7**: 218. 1912. Not *Bullaria Vernoniae* Arth. 1917.
Puccinia Arthuriana H. S. Jackson, Bot. Gaz. **65**: 395. 1918.

O. Pycnia epiphyllous, gregarious, few in groups 0.5–1 mm. across, punctiform, dark reddish-brown, globoid, 80–115 μ in diameter; ostiolar filaments about 35 μ long.

II. Uredinia hypophyllous, solitary or often surrounded by the telia, not usually abundant, roundish, about 0.5 mm. across, bright cinnamon-brown, ruptured epidermis evident; urediniospores flattened-globoid or globoid, 24–29 μ broad by 23–26 μ long; wall pale-yellow, 1.5–2 μ thick, moderately and prominently echinulate, the pores indistinct, apparently 4, equatorial.

III. Telia hypophyllous, usually in irregular groups 1.5–2 mm. across, roundish, 0.2–0.3 mm. across, pulvinate, light chestnut-brown, or cinereous by germination, ruptured epidermis not conspicuous; teliospores narrowly ellipsoid or fusiform, 16–24 by 55–70 μ, narrowed above and below, usually considerably constricted at septum; wall cinnamon-brown, uniformly thin, about 1 μ, smooth; pedicel fragile, colorless, one half to once length of spore.

ON CARDUACEAE:
Vernonia albicaulis Pers., Porto Rico.
Vernonia arbuscula Less., Bahamas.
Vernonia bahamensis Griseb., Bahamas.
Vernonia borinquensis Urban, Porto Rico.
Vernonia canescens H.B.K., Costa Rica.
Vernonia sericea Rich., Porto Rico.
TYPE LOCALITY: Cayey, Porto Rico, on *Vernonia borinquensis*.
DISTRIBUTION: Costa Rica and the West Indies.

31. **Bullaria fuscella** (Arth. & Johnston) Arthur & Mains.

Puccinia fuscella Arth. & Johnston, Mem. Torrey Club **17**: 157. 1918.

O. Pycnia unknown.

II. Uredinia hypophyllous, scattered, roundish, punctiform, minute, 0.1–0.2 mm. across, early naked, pulverulent, light cinnamon-brown, ruptured epidermis noticeable; urediniospores broadly ellipsoid or obovoid, 23–29 by 26–32 μ; wall light cinnamon-brown, moderately thick, 2–3 μ, echinulate, the pores indistinct, probably 4–6, scattered.

III. Telia hypophyllous, scattered or crowded in groups of two or three sori, irregularly roundish, small, 0.2–0.3 mm. across, rather early naked, dark chestnut-brown, ruptured epidermis inconspicuous; paraphyses peripheral, hyphoid, colorless, thin-walled, short and inconspicuous; teliospores oblong, 21–27 by 40–48 μ, slightly constricted at septum, rounded or obtuse at both ends; wall cinnamon-brown, 1.5–2 μ, thicker above, 5–9 μ, including a semi-hyaline umbo, minutely verrucose above appearing smooth; pedicel colorless, fragile, two thirds length of spore or less.

ON CARDUACEAE:
Vernonia menthaefolia (Poepp.) Less., Cuba.
TYPE LOCALITY: Baracoa, Cuba, on *Vernonia menthaefolia*.
DISTRIBUTION: Known only from the type locality.
EXSICCATI: Barth. N. Am. Ured. *772*.

32. **Bullaria Vernoniae** (Schw.) Arth. Mycologia **9**: 302. 1917.

Puccinia bullata Schw. Schr. Nat. Ges. Leipzig **1**: 74. 1822. Not *P. bullata* Link, 1815.
Puccinia Vernoniae Schw. Trans. Am. Phil. Soc. II. **4**: 296. 1832.
Puccinia Tanaceti Vernoniae Burrill, Bull. Ill. Lab. Nat. Hist. **2**: 186. 1885.
Puccinia Vernoniae longipes Dietel, Jour. Myc. **7**: 43. 1891.
Puccinia Vernoniae brevipes Dietel, Jour. Myc. **7**: 43. 1891.
Puccinia longipes Lagerh. Tromsö Mus. Aarsh. **17**: 64. 1895.
Dicaeoma longipes Kuntze, Rev. Gen. 3^3: 469. 1898.

O. Pycnia epiphyllous, few, scattered among the uredinia, small, punctiform, honey-yellow, becoming brown, globoid, 112 μ broad by 120–130 μ high; ostiolar filaments free.

II. Uredinia of the primary form chiefly epiphyllous, rather numerous, crowded in groups up to 4 mm. in length, often confluent, small, round, 0.3–0.5 mm. across, rather early naked, pulverulent, cinnamon-brown, ruptured epidermis inconspicuous; secondary uredinia amphigenous, gregarious like the primary form, on yellow spots, or more often scattered, small, 0.2–0.5 mm. across, ruptured epidermis often conspicuous; urediniospores of both forms obovoid or broadly ellipsoid, 20–26 by 22–30 μ; wall cinnamon-brown, 1.5–3 μ thick, moderately or sparsely and prominently echinulate, the pores 3, approximately equatorial.

III. Telia amphigenous and caulicolous, on the leaf-blades often gregarious or confluent in groups 0.5–1.5 mm. across, more often scattered, round, 0.2–0.5 mm. across, on the stems fusiform, 10–30 mm. long, early naked, becoming somewhat pulverulent, dark chocolate-brown, ruptured epidermis noticeable when epiphyllous, inconspicuous when hypophyllous; teliospores oblong or ellipsoid, often irregular, 20–28 by 30–45 μ, somewhat longer and narrower in caulicolous sori, 19–26 by 40–58 μ, obtuse or rounded above, rounded or narrowed below, slightly or not constricted at septum (more frequently so in caulicolous form); wall light chestnut-brown, minutely verrucose, often appearing smooth, moderately thick, 1.5–3 μ, thicker at apex, 5–10 μ, concolorous or often slightly lighter above; pedicel colorless, slender, once to twice length of spore, in the caulicolous form usually much longer.

ON CARDUACEAE:
Vernonia altissima Nutt. (*V. maxima* Small), Indiana, Michigan.
Vernonia Baldwinii Torr., Iowa, Illinois, Michigan, Mississippi, Missouri, Oklahoma.
Vernonia corymbosa Schw., North Dakota.
Vernonia crinita Raf., Arkansas, Michigan, Oklahoma.
Vernonia Ervendbergii A. Gray, San Luis Potosí.
Vernonia fasciculata Michx., Illinois, Iowa, Nebraska, South Dakota.
Vernonia guadalupensis A. Heller, Texas.
Vernonia interior Small, Kansas, Missouri, Nebraska, Oklahoma, Texas.
Vernonia marginata (Torr.) Raf., New Mexico, Texas.
Vernonia missurica Raf. (*V. Drummondii* Shuttlew.), Michigan, Missouri.
Vernonia noveboracensis (L.) Willd., Delaware, Pennsylvania.
Vernonia pulchella Small, Georgia.
Vernonia sp., Virginia.

TYPE LOCALITY: Salem, North Carolina, on *Vernonia* [*noveboracensis*].
DISTRIBUTION: Delaware to northern Iowa and Nebraska, and southward to Georgia and northeastern Mexico.
EXSICCATI: Barth. Fungi Columb. *2573, 2970, 3271, 3674, 4276;* Barth. N. Am. Ured. *69, 70, 578, 873, 874, 973, 1674, 1879, 2374;* Brenckle, Fungi Dak. *369;* Ellis & Ev. Fungi Columb. *263, 353, 1670, 1774;* Ellis & Ev. N. Am. Fungi *1847, 2988, 3050;* D. Griff. W. Am. Fungi *59, 59a;* Seym. & Earle, Econ. Fungi Suppl. *B20;* Sydow, Ured. *273, 1015.*

33. **Bullaria inaequata** (Jackson & Holway) Arthur & Mains.

Puccinia inaequata Jackson & Holway; H. S. Jackson, Bot. Gaz. **65**: 309. 1918.

O. Pycnia epiphyllous, few, gregarious in the center of lighter colored spots, noticeable, depressed-globoid, 100–120 μ high by 100–175 μ broad; ostiolar filaments short.

II. Uredinia of the primary form chiefly epiphyllous, crowded and somewhat confluent in concentric groups 2.2 mm. across, surrounding the pycnia, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; secondary uredinia amphigenous, numerous, scattered, roundish, small, 0.2–0.5 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores of both forms obovoid or broadly ellipsoid, 18–23 by 23–28 μ, pale cinnamon-brown, 1.5–3 μ thick, prominently and sparsely echinulate, the pores 2 or 3, approximately equatorial.

III. Telia amphigenous, scattered, round, small, 0.2–0.5 mm. across, early naked, at first pulvinate becoming somewhat pulverulent, blackish-brown, ruptured epidermis conspicuous; teliospores oblong or broadly ellipsoid, 22–26 by 30–38 μ, rounded at both ends, not or scarcely constricted at septum; wall dark cinnamon- or chestnut-brown, 2.5–3 μ thick, slightly thickened at apex, 4–5 μ, finely and evenly verrucose-rugose, the pore of lower cell below the middle; pedicel colorless, short, usually deciduous, often attached laterally.

ON CARDUACEAE:
Vernonia patens H.B.K., Guatemala.
TYPE LOCALITY: Escuintla, Guatemala, on *Vernonia patens.*
DISTRIBUTION: Southern Guatemala.

34. **Bullaria semiinsculpta** (Arth.) Arthur & Mains.

Puccinia semiinsculpta Arth. Bot. Gaz. **40**: 204. 1905.

O. Pycnia epiphyllous, few in small groups, punctiform, honey-yellow becoming brown immersed, globoid, 150–180 μ across.

II. Uredinia of the primary form epiphyllous, surrounding the pycnia on yellowish hypertrophied spots with purple border; secondary uredinia scattered, round, small, 0.2–0.3 mm. across, soon naked, pale cinnamon-brown, pulverulent, ruptured epidermis noticeable; urediniospores of both forms broadly ellipsoid, obovoid, or globoid, 18–26 by 22–30 μ; wall golden-yellow fading to nearly colorless, moderately thick, 1.5–3 μ, sparsely and evenly echinulate, the pores indistinct, 2 or 3, equatorial.

III. Telia amphigenous, or often only epiphyllous, scattered, round, small, 0.2–0.5 mm. across, often confluent, soon naked, compact or pulverulent, chocolate-brown, becoming cinereous from germination, ruptured epidermis inconspicuous; teliospores ellipsoid or ellipsoid-obovoid, 22–38 by 38–50 μ, rounded above, rounded or somewhat narrowed below, slightly or not constricted at septum; wall golden-brown in the germinating form to chocolate-brown in the pulverulent form, 3–6 μ thick, slightly or not thicker at apex, 4–10 μ, much thinner at base in the germinating form, with irregular, crowded sculpturing, finely to coarsely reticulate-verrucose; pedicel colorless, rather slender, 5–9 μ thick, once to twice length of spore, minutely rugose, or nearly smooth.

ON CARDUACEAE:
Vernonia Alamani DC., Mexico (state), Michoacan, Oaxaca.
Vernonia dictyophlebia Gleason, Michoacan.
Vernonia Karvinskiana DC., Oaxaca.
Vernonia serratuloides H.B.K. (*V. umbellifera* Gleason), Jalisco.
Vernonia sp., Morelos.
TYPE LOCALITY: Amecameca, Mexico, on *Vernonia Alamani.*
DISTRIBUTION: Southern Mexico.
EXSICCATI: Barth. Fungi. Columb. *4573;* Barth. N. Am. Ured. *168, 1570.*

35. **Bullaria idonea** (Jackson & Holway) Arthur & Mains.

Puccinia idonea Jackson & Holway; H. S. Jackson, Bot. Gaz. **65**: 304. 1918.

O. Pycnia unknown.

II. Uredinia amphigenous, scattered or somewhat crowded, frequently confluent along the midribs and larger veins, roundish or somewhat elongate, 0.3–0.6 mm. across, early naked, pulverulent, lemon-yellow fading to white, ruptured epidermis conspicuous; urediniospores broadly ellipsoid or obovoid, 18–21 by 23–28 μ; wall colorless, thin, 1–1.5 μ, finely and moderately echinulate, the pores obscure, but apparently equatorial.

III. Telia amphigenous, chiefly hypophyllous, scattered or somewhat crowded and frequently confluent along the midribs and larger veins, roundish or somewhat elongate, 0.3–0.6 mm. across, early naked, pulvinate, becoming pulverulent, blackish-brown, ruptured epidermis conspicuous; teliospores broadly ellipsoid, 23–28 by 35–45 μ, rounded at both ends, not or scarcely constricted at septum; wall chestnut-brown, moderately thick, 3–4 μ, slightly thickened at apex and over pore of lower cell to 7 μ, prominently and evenly verrucose, with broad low projections rather closely set, sometimes arranged in lines; pedicel colorless, flexuous, 3–5 μ thick, transversely rugose at base and swelling slightly, twice length of spore.

ON CARDUACEAE:
Eremosis trifloscula (H.B.K.) Gleason (*Vernonia trifloscula* H.B.K.), Costa Rica; Guatemala.
TYPE LOCALITY: Escuintla, Guatemala, on *Vernonia trifloscula*.
DISTRIBUTION: Central America.

36. **Bullaria praealta** (Jackson & Holway) Arthur & Mains.

Puccinia praealta Jackson & Holway; H. S. Jackson, Bot. Gaz. **65**: 306. 1918.
Puccinia Tonduziana Speg. Bol. Acad. Nac. Ci. Cordoba **23**: 184. 1919.

O. Pycnia unknown.

II. Uredinia epiphyllous, densely gregarious and often confluent on irregular spots 0.5–2 mm. across, bullate, 0.2–0.4 mm. across, long covered by the overarching and conspicuous epidermis, deep-seated, arising from below the palisade layer, pulverulent, light-yellow fading to whitish; urediniospores ellipsoid or obovoid, 18–20 by 24–28 μ; wall pale-yellow or colorless, thin, 1–1.5 μ, finely and moderately echinulate, the pores obscure, apparently 2, equatorial.

III. Telia epiphyllous, densely gregarious and often confluent on irregular spots 0.5–1.5 mm. across, becoming scattered, bullate, 0.2–0.4 mm. across, long covered by the overarching and conspicuous epidermis, deep-seated, arising from below the palisade layer, compact, chestnut-brown; teliospores ellipsoid, 24–28 by 32–40 μ, rounded at both ends, slightly or not constricted at septum; wall light chestnut-brown, 3–4 μ thick, slightly thickened over the pore of either cell, 4–5 μ, rather prominently and sparsely verrucose with conic projections; pedicel colorless, once to twice length of spore.

ON CARDUACEAE:
Eremosis trifloscula (H.B.K.) Gleason (*Vernonia trifloscula* H.B.K.), Costa Rica; Guatemala.
TYPE LOCALITY: Mazatenango, Guatemala, on *Vernonia trifloscula*.
DISTRIBUTION: Central America.
ILLUSTRATION: Bol. Acad. Nac. Ci. Cordoba **23**: 185.

37. **Bullaria (?) egregia** (Arth.) Arthur & Mains.

Puccinia egregia Arth. Bot. Gaz. **40**: 204. 1905.

O. Pycnia unknown.

II. Uredinia not seen; urediniospores from telial sori globoid or obovoid, 23–26 by 24–28 μ; wall golden-yellow, rather thick, 1.5–2.5 μ, moderately echinulate, the pores obscure, apparently 3, equatorial.

III. Telia amphigenous, scattered, round, 0.2–0.5 mm. across, early naked, pulvinate, becoming somewhat pulverulent, chocolate-brown, ruptured epidermis inconspicuous; teliospores broadly ellipsoid, 26–30 by 35–45 μ, rounded at both ends, not constricted at septum; wall chestnut-brown, very thick, 4–6 μ, very slightly thickened at apex and over pore of

lower cell, the latter placed near the pedicel, uniformly coarsely and prominently verrucose with conic and well-separated papillae; pedicel slender, 4–6 μ thick, the wall thin, smooth, colorless, once to twice length of spore or occasionally longer.

ON CARDUACEAE:

Eremosis salicifolia (DC.) Gleason (*Vernonia uniflora* Schultz-Bip., *V. salicifolia* Schultz-Bip.), Oaxaca.

TYPE LOCALITY: Oaxaca, Mexico, on *Vernonia uniflora*.

DISTRIBUTION: Known only from the type locality.

38. **Bullaria (?) Conoclinii** (Seym.) Arthur & Mains.

Puccinia Conoclinii Seym.; Burrill, Bot. Gaz. **9**: 191. 1884.
Dicaeoma Conoclinii Kuntze, Rev. Gen. **3**^{3}: 468. 1898.
Puccinia rosea Arth. Bot. Gaz. **40**: 206. 1905. (Exclusive of aecia.)
Dicaeoma roseum Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.
Uredo Ageratí Mayor, Mém. Soc. Neuch. Sci. Nat. **5**: 595. 1913.

O. Pycnia unknown.

II. Uredinia chiefly hypophyllous, scattered or somewhat gregarious, round, small, 0.2–0.5 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis scarcely noticeable; urediniospores broadly ellipsoid, obovoid or globoid, 16–24 by 18–32 μ; wall pale cinnamon-brown, 1–1.5 μ thick, moderately echinulate, the pores 2, rarely 3, equatorial.

III. Telia chiefly hypophyllous, scattered, round, 0.5–0.8 mm. across, early naked, loose and sometimes pulverulent, dark chocolate-brown, ruptured epidermis scarcely noticeable; teliospores ellipsoid, 22–32 by 34–45 μ, rounded at both ends, slightly or not constricted at septum; wall dark chestnut-brown, concolorous or with slightly lighter umbo, 2.5–4 μ thick, thicker at apex and over pore of lower cell and at septum up to 8 μ, moderately and evenly verrucose; pedicel colorless, except near the spore, delicate, 6–8 μ thick, two to two and a half times length of spore, sometimes laterally attached.

ON CARDUACEAE:

Ageratum conyzoides L., Guatemala; Porto Rico.
Ageratum corymbosum Zucc., Morelos.
Ageratum corymbosum latifolium (DC.) B. L. Robinson, Guatemala.
Ageratum maritimum H.B.K., Cuba.
Ageratum rugosum Coult., Guatemala.
Ageratum strictum Hemsl., Morelos.
Conoclinium betonicum DC. (*Eupatorium betonicum* Hemsl.), Coahuila.
Conoclinium coelestinum (L.) DC. (*Eupatorium coelestinum* L.), Alabama, District of Columbia, Illinois, Indiana, Kentucky, Mississippi, Missouri, Oklahoma, South Carolina, Tennessee, Texas, West Virginia.
Conoclinium dichotomum Chapm., Florida.
Conoclinium Greggii (A. Gray) Small (*Eupatorium Greggii* A. Gray), Coahuila.
Eupatorium collinum DC., Guatemala.
Eupatorium deltoideum Jacq., Mexico (state), Oaxaca.
Eupatorium geranifolium Urban, Porto Rico.
Eupatorium glandulosum H.B.K., Guatemala.
Eupatorium Gonzalezii B. L. Robinson, Oaxaca.
Eupatorium Holwayanum B. L. Robinson, Oaxaca.
Eupatorium hymenolepis B. L. Robinson, Michoacan.
Eupatorium incarnatum Walt., Indiana, Louisiana.
Eupatorium Mendezii DC., Oaxaca.
Eupatorium Neaeanum DC., Oaxaca; Guatemala.
Eupatorium polyodon Urban, Porto Rico.
Eupatorium porphyranthemum A. Gray, Coahuila.
Eupatorium pycnocephaloides B. L. Robinson, Guatemala.
Eupatorium pycnocephaloides glandulipes B. L. Robinson, Guatemala.
Eupatorium pycnocephalum Less., Costa Rica; Guatemala.
Eupatorium Schaffneri Schultz-Bip., Hidalgo.
Eupatorium Sinclairi Benth., Costa Rica.
Eupatorium solidaginifolium A. Gray, Arizona.
Eupatorium villosum Sw., Cuba.

TYPE LOCALITY: Pine Hills, Union County, Illinois, on *Conoclinium coelestinum*.

DISTRIBUTION: District of Columbia to central Indiana and southern Arizona, southward through Central America and the West Indies; also in South America and Hawaii.

EXSICCATI: Barth. Fungi Columb. *4864;* Barth. N. Am. Ured. *57, 232, 1367, 1537, 1538, 2237, 2346, 2543;* Ellis N. Am. Fungi *1467;* Ellis & Ev. Fungi Columb. *482;* Kellerm. Fungi Sel. Guat. *7;* Seym. & Earle, Econ. Fungi Suppl. *B9a, b.*

39. **Bullaria (?) concinna** (Arth.) Arthur & Mains.

Puccinia concinna Arth. Bot. Gaz. **40**: 205. 1905.

O. Pycnia unknown.

II. Uredinia amphigenous, scattered, roundish, 0.25–0.5 mm. across, soon naked, light cinnamon-brown, pulverulent, ruptured epidermis conspicuous; urediniospores globoid or obovoid, 19–23 by 23–28 μ; wall cinnamon-brown, thin, 1–1.5 μ, moderately and minutely echinulate, the pores 2, occasionally 3, approximately equatorial.

III. Telia chiefly hypophyllous, scattered, roundish, 0.3–0.6 mm. across, soon naked, blackish, pulvinate, ruptured epidermis conspicuous; teliospores oblong or ellipsoid, 26–30 by 40–48 μ, rounded or obtuse above, rounded below, slightly or not constricted at septum; wall chocolate-brown, obscurely granulose-verrucose, appearing smooth, thick, 3–5 μ, thicker above, 6–10 μ, concolorous; pedicel colorless, except next to spore, delicate, once to thrice length of spore, usually deciduous and appearing short.

ON CARDUACEAE:
Conoclinium Greggii (A. Gray) Small (*Eupatorium Greggii* A. Gray), Chihuahua.
TYPE LOCALITY: Sierre Madre, Mexico, on *Eupatorium Greggii*.
DISTRIBUTION: Known only from the type locality.

40. **Bullaria (?) basiporula** (Jackson & Holway) Arthur & Mains.

Puccinia basiporula Jackson & Holway; Arth. Am. Jour. Bot. **5**: 528. 1918.

O. Pycnia unknown.

II. Uredinia hypophyllous, few, scattered, round, small, 0.2–0.3 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores globoid, sometimes flattened at hilum, 21–24 μ in diameter; wall cinnamon-brown, thin, 1–1.5 μ, closely and finely echinulate, the pores 2, near the hilum.

III. Telia chiefly hypophyllous, scattered, round, small, 0.3–0.5 mm. across, early naked, somewhat pulverulent, blackish-brown, ruptured epidermis inconspicuous; teliospores ellipsoid, 23–26 by 32–35 μ, rounded at both ends, slightly constricted at septum; wall chestnut-brown, 1.5–2.5 μ, thickened at apex and over pore of lower cell to 5 μ, closely and distinctly verrucose; pedicel colorless, persistent, 7 μ in diameter, the wall thin, once and a half to twice length of spore, often attached obliquely.

ON CARDUACEAE:
Eupatorium Mairetianum DC., Guatemala.
Eupatorium Mairetianum adenopodum B. L. Robinson, Guatemala.
Eupatorium rafaelense Coulter, Guatemala.
TYPE LOCALITY: Cerro Quemado, Quezaltenango, Guatemala, on *Eupatorium Mairetianum adenopodum*.
DISTRIBUTION: Western Guatemala.
EXSICCATI: Kellerm. Fungi Sel. Guat. *14*.

41. **Bullaria (?) Hodgsoniana** (Kern) Arthur & Mains.

Puccinia Hodgsoniana Kern; Arth. Am. Jour. Bot. **5**: 526. 1918.

O. Pycnia unknown.

II. Uredinia hypophyllous, scattered, or occasionally gregarious and confluent, small, round, 0.25–0.5 mm. across, early naked, pulverulent, chestnut-brown, ruptured epidermis conspicuous; urediniospores ellipsoid or obovoid, 19–26 by 24–30 μ; wall chestnut-brown, 1.5–2.5 μ thick, moderately and finely echinulate, the pores 2, near the hilum, rarely 3, all at hilum, or one of the three near the apex.

III. Telia chiefly hypophyllous, scattered, small, round, 0.5–0.8 mm. across, early naked, pulverulent, blackish-brown, ruptured epidermis inconspicuous; teliospores oblong or ellipsoid, 24–29 by 40–45 μ, rounded or obtuse above, rounded below, scarcely constricted at septum; wall chestnut-brown, 3–4 μ thick, lighter colored and thicker at apex, 5–9 μ, equally thickened over pore of lower cell, closely and prominently verrucose; pedicel colorless, once to twice length of spore, occasionally attached obliquely.

ON CARDUACEAE:
Eupatorium phoenicolepis guatemalensis B. L. Robinson, Guatemala.
Eupatorium Schultzii erythranthodium B. L. Robinson, Guatemala.

Eupatorium Schultzii ophryolepis B. L. Robinson, Guatemala.
Eupatorium Schultzii velutipes B. L. Robinson, Guatemala.

TYPE LOCALITY: Volcan Acatenango, Sacatepequez, Guatemala, on *Eupatorium phoenicolepis guatemalensis*.

DISTRIBUTION: Central Guatemala.

42. **Bullaria (?) solidipes** (Jackson & Holway) Arthur & Mains.

Puccinia solidipes Jackson & Holway; Arth. Am. Jour. Bot. 5: 527. 1918.

O. Pycnia unknown.

II. Uredinia hypophyllous, scattered, or somewhat gregarious, round, small, 0.1–0.3 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis barely noticeable; urediniospores globoid or obovoid, somewhat irregular, 23–29 by 26–32 μ; wall dark cinnamon-brown, thin, 1–1.5 μ, closely and finely echinulate, the pores 2, sometimes 3, approximately equatorial.

III. Telia amphigenous, numerous, scattered on under surface of leaves, often crowded and more or less confluent on upper surface, early naked, somewhat pulverulent, blackish-brown, ruptured epidermis noticeable; teliospores broadly ellipsoid, 30–35 by 38–45 μ, rounded at both ends, slightly constricted at septum; wall chestnut-brown, smooth, rather thick, 2.5–4 μ, slightly thicker above by a lighter umbo over the pore, 5–6 μ; pedicel colorless, persistent, the wall thickened, often nearly obliterating the lumen, the surface granulose at base, 6–7 μ in diameter, twice to thrice length of spore.

ON CARDUACEAE:
Eupatorium tubiflorum Benth., Michoacan; Guatemala.

TYPE LOCALITY: Volcan de Agua, Sacatepequez, Guatemala, on *Eupatorium tubiflorum*.

DISTRIBUTION: Southwestern Mexico to central Guatemala.

43. **Bullaria (?) Espinosarum** (Dietel & Holway) Arthur & Mains.

Puccinia Espinosarum Dietel & Holway; Holway, Bot. Gaz. **31**: 332. 1901.

O. Pycnia unknown.

II. Uredinia amphigenous, scattered, small, 0.25–0.4 mm., early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores reniform, 19–23 μ high, 29–34 μ long, 19–26 μ broad; wall cinnamon-brown, rather thin, 1.5–2 μ, sparsely and prominently echinulate, the pores 2, opposite in either end, approximately equatorial.

III. Telia amphigenous, scattered, small, 0.25–0.3 mm. across, sometimes confluent, early naked, somewhat pulverulent, blackish, ruptured epidermis noticeable; teliospores semi-opaque, broadly elliptic, 30–33 by 35–45 μ, rounded at both ends and strongly depressed when dry, slightly or not constricted at septum; wall dark chocolate-brown, uniform, smooth, rather thick, 3–4 μ, slightly thicker at apex and over pore of lower cell, 4–6 μ; pedicel colorless, firm, stout, 7–9 μ, solid at apex, swelling below to 16 μ, the wall very thick, 5–7 μ, almost obliterating the lumen, twice to twice and a half length of spore, often attached somewhat to one side.

ON CARDUACEAE:
Eupatorium Espinosarum A. Gray, Oaxaca.
Eupatorium Smithii B. L. Robinson, Oaxaca.
Eupatorium sordidum Less., Oaxaca.
Eupatorium spiraeaefolium Schultz-Bip., Veracruz.

TYPE LOCALITY: Oaxaca, Mexico, on *Eupatorium Espinosarum*.

DISTRIBUTION: Southern Mexico.

EXSICCATI: Barth. N. Am. Ured. *236, 1241.*

44. **Bullaria (?) inanipes** (Dietel & Holway) Arthur & Mains.

Puccinia inanipes Dietel & Holway; Holway, Bot. Gaz. **31**: 332. 1901.

O. Pycnia unknown.

II. Uredinia amphigenous, scattered, very small, punctiform, early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores reniform, 23–27 μ from pore to pore, 19–24 μ broad at right angles, 18–21 μ high; wall cinnamon-brown, about 1 μ thick below, gradually becoming thicker above, 2 μ, moderately and prominently echinulate, the pores 2, one at each end, approximately equatorial.

III. Telia amphigenous, scattered, very small, punctiform, often confluent, early naked, somewhat pulverulent, blackish, ruptured epidermis inconspicuous; teliospores semi-opaque, broadly ellipsoid, 28–32 by 32–40 μ, rounded at both ends, strongly depressed when dry, slightly or not constricted at septum; wall dark chocolate-brown, smooth, moderately thick, 2.5–3 μ, slightly thicker at apex and over pore of lower cell, 4–6 μ; pedicel colorless, firm, stout, 7–9 μ at apex, swelling below, 10–12 μ, granulose when dry, the wall thin, 1–1.5 μ, once to thrice length of spore.

ON CARDUACEAE:
Eupatorium brevipes DC., Oaxaca.
Eupatorium hirsutum DC., Morelos.
Eupatorium sp., Jalisco.
TYPE LOCALITY: Oaxaca, Mexico, on *Eupatorium brevipes*.
DISTRIBUTION: Southern Mexico.
EXSICCATI: Barth. N. Am. Ured. *150*.

45. **Bullaria (?) inermis** (Jackson & Holway) Arthur & Mains.

Puccinia inermis Jackson & Holway; Arth. Mycologia **10**: 142. 1918.

O. Pycnia unknown.

II. Uredinia hypophyllous, few, scattered, round, small, 0.2–0.4 mm. in diameter, early naked, pulverulent, dark cinnamon-brown, ruptured epidermis conspicuous; urediniospores greatly compressed laterally, somewhat flattened beneath, appearing somewhat reniform when seen from the side with pores in optical section, 30–34 μ in breadth from pore to pore, 24–26 μ broad at right angles, 23–26 μ from hilum to apex; wall cinnamon-brown, 1–1.5 μ thick, finely and moderately echinulate, the pores 2, equatorial, one at each end.

III. Teliospores in the uredinia, broadly ellipsoid, 24–26 by 31–37 μ, rounded at either end, distinctly constricted at septum; wall chestnut-brown, uniformly 1.5–2 μ thick or thickened to 3 μ at pores, smooth, the pore of upper cell often placed laterally, pore of lower cell usually about half way between septum and pedicel; pedicel colorless, deciduous, or equaling the spore in length.

ON CARDUACEAE:
Eupatorium sp., Costa Rica.
TYPE LOCALITY: El Alto, near Cartago, Costa Rica, on *Eupatorium* sp.
DISTRIBUTION: Known only from the type locality.

46. **Bullaria (?) redempta** (H. S. Jackson) Arthur & Mains.

Puccinia redempta H. S. Jackson, Mycologia **14**: 107. 1922.

O. Pycnia unknown.

II. Uredinia hypophyllous, scattered or sometimes crowded and more or less confluent, roundish or elliptic, 0.5–1 mm. across, tardily naked, pulverulent, chestnut-brown, ruptured epidermis cinereous, conspicuous; urediniospores globoid or ellipsoid, somewhat irregular, 23–27 by 26–32 μ; wall dark cinnamon-brown, 1.5–2 μ thick, moderately echinulate, the pores 2, approximately equatorial.

III. Telia hypophyllous, scattered, roundish, 0.5–0.8 mm. across, tardily naked, pulverulent, chocolate-brown, ruptured epidermis cinereous, conspicuous; teliospores ellipsoid, somewhat irregular, 30–35 by 43–58 μ, rounded at both ends, slightly constricted at septum; wall chestnut-brown, 3–4 μ thick, slightly thickened at apex, 5–7 μ, concolorous or slightly lighter in color at apex, smooth; pedicel colorless, flexuous, short, deciduous, or equaling the spore, often attached obliquely.

ON CARDUACEAE:
Eupatorium atriplicifolium Lam., Tortola.
TYPE LOCALITY: Tortola, West Indies, on *Eupatorium atriplicifolium*.
DISTRIBUTION: Known only from the type locality.

47. **Bullaria Kuhniae** (Schw.) Kern, Trans. Am. Micr. Soc. **32**: 65. 1913.

Puccinia Kuhniae Schw. Trans. Am. Phil. Soc. II. **4**: 296. 1832.
Puccinia Brickelliae Peck, Bull. Torrey Club **12**: 34. 1885.
Dicaeoma Brickelliae Kuntze, Rev. Gen. 3^3: 468. 1898.

Dicaeoma Kuhniae Kuntze, Rev. Gen. 3³: 469. 1898.
Puccinia Barroetiae Sydow, Monog. Ured. 1: 28. 1902.

O. Pycnia amphigenous, in small groups, honey-yellow, immersed, punctiform, globose, 80–110 μ in diameter; ostiolar filaments 50–65 μ long.

II. Uredinia amphigenous, chiefly hypophyllous, scattered or at first gregarious, small, 0.2–0.8 mm. across, round, early naked, pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores flattened laterally, globoid or broadly ellipsoid when pores are seen in face view, 24–29 by 24–34 μ, narrowly ellipsoid or oblong when pores are seen in optical section, 14–20 by 24–34 μ; wall cinnamon-brown, 1.5–2.5 μ thick, moderately echinulate except over a variable area surrounding the pores which is smooth, the pores 2, opposite and equatorial.

III. Telia amphigenous, chiefly hypophyllous, occasionally caulicolous, scattered or gregarious, round, 0.5–1.5 mm. across when on blade of leaf, elongate and confluent to 3–5 mm. when on stems, pulvinate, becoming somewhat pulverulent, chocolate-brown, early naked, ruptured epidermis noticeable; teliospores broadly ellipsoid or oblong, 26–40 by 32–58 μ; rounded or obtuse above, rounded or occasionally slightly narrowed below, slightly or not constricted at septum; wall chestnut-brown, smooth, 3–6 μ thick, slightly thickened at apex and over pore of lower cell near septum by a low or frequently somewhat abrupt subhyaline umbo; pedicel colorless, 5–9 μ thick, fragile, flexuose, the wall thin, once to several times length of spore, often deciduous.

ON CARDUACEAE:
Barroetia subuligera (Schauer) A. Gray, Aquascalientes.
Coleosanthus Coulteri (A. Gray) Kuntze (*Brickellia Coulteri* A. Gray), Arizona.
Coleosanthus megalodontus (Greenm.) Arth., (*Brickellia megalodonta* Greenm.), Jalisco.
Kuhnia eupatorioides L., Illinois, Indiana, Iowa, Mississippi, Missouri, Nebraska.
Kuhnia glutinosa Ell., Kansas, Missouri, Nebraska, North Dakota, South Dakota, Wisconsin, Wyoming.
Kuhnia Hitchcockii A. Nelson, Colorado, Montana.
Kuhnia leptophylla Scheele (*K. Gooddingii* A. Nelson), Colorado.
Kuhnia rosmarinifolia Vent., New Mexico, Texas.
TYPE LOCALITY: "Bethlehem, Pennsylvania," probably error for Hope, Indiana, on *Kuhnia* sp.
DISTRIBUTION: Northern Indiana to Montana and southward to central Mexico.
EXSICCATI: Barth. Fungi Columb. *2360, 3946, 4268;* Barth. N. Am. Ured. *152, 243, 350, 644, 1765, 2152, 2361;* Ellis & Ev. Fungi Columb. *1454, 2152;* Ellis, N. Am. Fungi *1054;* D. Griff. W. Am. Fungi *95, 270;* Rab.-Paz. Fungi Eur. *4126;* Seym. & Earle, Econ. Fungi Suppl. *B14;* Sydow, Ured. *69*.

48. **Bullaria subdecora** (Sydow & Holway) Arthur & Mains.

Puccinia subdecora Sydow & Holway; Sydow, Ann. Myc. 1: 17. 1903.

O. Pycnia imperfectly known, caulicolous, gregarious, inconspicuous, globoid, 80–100 μ in diameter; ostiolar filaments short.

II. Uredinia amphigenous, scattered or gregarious, round or oblong, 0.3–0.5 mm. across or more elongate and often confluent when caulicolous, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores ellipsoid or obovoid, occasionally pyriform, somewhat flattened laterally, 19–26 by 26–34 μ; wall cinnamon-brown, uniformly 1.5–3.5 μ thick, inconspicuously and moderately echinulate, often with smooth area about the pore, the pores 2, equatorial or superequatorial.

III. Telia amphigenous, chiefly hypophyllous, occasionally caulicolous, scattered, round, 1–1.5 mm. across or oval and often confluent when caulicolous, early naked, somewhat pulverulent, pulvinate, chocolate-brown, ruptured epidermis conspicuous; teliospores ellipsoid or oblong, 21–30 by 35–52 μ, rounded or obtuse above, rounded or somewhat tapering below, slightly constricted at septum; wall chestnut-brown, finely and inconspicuously verrucose-rugose, 2–5 μ thick, a semi-hyaline thickening over apex and pore of lower cell, 5–8 μ, the pore of lower cell at septum or midway between septum and pedicel; pedicel colorless, short, broad at point of attachment, 9–10 μ, tapering below, largely deciduous.

ON CARDUACEAE:
Coleosanthus grandiflorus (Hook.) Kuntze (*Brickellia grandiflora* Nutt.), Colorado, Utah.
TYPE LOCALITY: Georgetown, Colorado, on *Brickellia grandiflora*.
DISTRIBUTION: Central Colorado to central Utah.
EXSICCATI: Barth. N. Am. Ured. *2471;* Clements, Crypt. Form. Colo. *577;* Garrett, Fungi Utah. *239*.

49. **Bullaria (?) decora** (Dietel & Holway) Arthur & Mains.

Puccinia pinguis Dietel & Holway; Holway, Bot. Gaz. **24**: 34. Jl 1897. Not *P. pinguis* Dietel, F 1897.
Puccinia decora Dietel & Holway, Hedwigia **37**: 202. 1898.

O. Pycnia unknown.

II. Uredinia amphigenous, chiefly hypophyllous, numerous, scattered, small, 0.2–0.5 mm. across, early naked, becoming pulverulent, cinnamon-brown, ruptured epidermis scarcely noticeable; urediniospores ellipsoid or broadly ellipsoid, 24–28 by 28–32 μ, slightly flattened laterally; wall chestnut-brown, uniformly 2.5–3.5 μ thick when viewed with pores in face view, when seen in optical section 1.5–2 μ at sides and 2.5–3.5 μ at apex and base, inconspicuously and somewhat sparsely echinulate, the pores 2, equatorial, each covered with a noticeable hyaline cap.

III. Telia hypophyllous, few, scattered, small, 0.2–0.5 mm. across, early naked, becoming pulverulent, chestnut-brown, ruptured epidermis not conspicuous; teliospores broadly ellipsoid, 32–35 by 42–50 μ, rounded above and below, scarcely constricted at septum; wall chestnut-brown, 4–6 μ thick, thickened above, 8–10 μ, concolorous, or with semi-hyaline umbo, also similarly thickened over pore of lower cell which is situated approximately half way between the septum and pedicel, smooth; pedicel colorless, short, the wall thin.

ON CARDUACEAE:
Coleosanthus sp. (*Brickellia* sp.), Mexico (state).
TYPE LOCALITY: Rio Hondo, near City of Mexico, Mexico, on *Brickellia* sp.
DISTRIBUTION: Known only from the type locality.

50. **Bullaria Baccharidis-multiflorae** (Dietel & Holway) Arthur & Mains.

Puccinia Baccharidis-multiflorae Dietel & Holway; Holway, Bot. Gaz. **31**: 331. 1901.
Eriosporangium Baccharidis-multiflorae Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.
Argomyces Baccharidis-multiflorae Arth. N. Am. Flora **7**: 218. 1912.

O. Pycnia epiphyllous, few in a group, flattened-globoid, 100–112 μ broad by 70–90 μ high; ostiolar filaments 29–32 μ long.

II. Uredinia of the primary form epiphyllous, surrounding the pycnia; uredinia of the secondary form hypophyllous, scattered, round, 0.2–0.5 mm. across, early naked, pulverulent, bright cinnamon-brown, ruptured epidermis evident; urediniospores obovate, 21–29 by 30–39 μ, rounded or obtuse above, usually narrowed below; wall golden-brown, moderately thin, 1–2 μ, greatly thickened above, 3–7 μ, strongly and sparsely echinulate with points about 3 μ apart, the pores 3, prominent, equatorial, usually covered by the inflated cuticle.

III. Telia hypophyllous, scattered, round, 0.3–0.7 mm. across, pulvinate, light chestnut-brown, or cinereous by germination, ruptured epidermis inconspicuous; teliospores broadly oblong or oblong-obovate, 21–27 by 40–50 μ, rounded or obtuse at both ends, slightly constricted at septum; wall smooth, cinnamon-brown, often paler above, thin, 1–1.5 μ, greatly thickened above, 5–12 μ, also greatly thickened over pore of lower cell close to septum, 3–7 μ; pedicel nearly or quite colorless, terete, slender, 5–7 μ thick, one half to once and a half length of spore.

ON CARDUACEAE:
Baccharis elegans H.B.K., Oaxaca.
Baccharis multiflora H.B.K., Mexico (state).
Baccharis serraefolia DC., Guatemala.
TYPE LOCALITY: Amecameca, Mexico, on *Baccharis multiflora*.
DISTRIBUTION: Southern Mexico and Central America.

51. **Bullaria triannulata** (Berk. & Curt.) Arthur & Mains.

Uromyces triannulatus Berk. & Curt.; Berk. Grevillea **3**: 56. 1874.
Puccinia mirifica Dietel & Holway; Dietel, Erythea **3**: 79. 1895.
Caeomurus triannulatus Kuntze, Rev. Gen. 3^3: 451. 1898.
Dicaeoma triannulatum Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.
Puccinia triannulata H. S. Jackson, Mycologia **14** : 111. 1922.

O. Pycnia chiefly hypophyllous, scattered over large areas, numerous, preceding or accompanying the uredinia, prominent, honey-yellow becoming blackish-brown, flattened-globoid, 128–144 μ in diameter by 65–90 μ high; ostiolar filaments 50–85 μ long.

II. Uredinia hypophyllous, evenly and densely scattered over large areas from a diffused mycelium, early naked, roundish or oblong, prominent, 0.5 mm. across, pulverulent, dark cinnamon-brown, ruptured epidermis overarching and conspicuous; urediniospores obovoid or globoid, 19–24 by 24–32 μ; wall cinnamon-brown, moderately thick, 2–3 μ, evenly echinulate, the pores 2, superequatorial, irregularly disposed.

III. Telia hypophyllous, evenly and densely scattered over large areas from a diffused mycelium, early naked, roundish or oblong, prominent, 0.5 mm. across, somewhat pulverulent, dark cinnamon-brown, ruptured epidermis overarching and conspicuous; teliospores irregularly ellipsoid or obovate-ellipsoid, 23–30 by 40–52 μ, rounded or rarely obtuse at both ends, often slightly narrowed below, slightly or not constricted at septum; wall dark cinnamon-brown, moderately and uniformly thick, 3 μ, closely and finely verrucose; pedicel colorless, short, largely deciduous.

ON CARDUACEAE:
Borrichia arborescens (L.) DC., Florida; Bahamas; Bermuda.
Borrichia frutescens (L.) DC., Florida, South Carolina, Texas.
TYPE LOCALITY: South Carolina, on *Borrichia frutescens*.
DISTRIBUTION: South Carolina to Florida and southern Texas and in the Bahama and Bermuda islands.
EXSICCATI: Barth. Fungi Columb. *4061;* Barth. N. Am. Ured. *157*.

52. **Bullaria Balsamorhizae** (Peck) Arthur & Mains.

Trichobasis Balsamorhizae Peck, Bot. Gaz. **6**: 276. 1881.
Uredo Balsamorhizae De-Toni; Sacc. Syll. Fung. **7**: 842. 1882.
Trichobasis Wyethiae Peck, Bot. Gaz. **7**: 45. 1882.
Puccinia Balsamorhizae Peck, Bull. Torrey Club **11**: 49. 1884.
Puccinia Wyethiae Peck; Hark. Bull. Calif. Acad. **2**: 442. 1887.
Dicaeoma Balsamorhizae Kuntze, Rev. Gen. **3**^{3}: 468. 1898.

O. Pycnia petiolicolous or subcostal, few, gregarious, inconspicuous, orange-yellow, flask-shaped, 70–100 by 100–130 μ; ostiolar filaments slightly projecting.

II. Uredinia amphigenous, scattered or gregarious, 0.5–1 mm. across, often confluent on petioles and veins, 1–5 mm. in length, early naked, pulverulent, chestnut-brown, ruptured epidermis noticeable; urediniospores globoid or broadly ellipsoid, slightly flattened laterally, 23–30 by 26–32 μ; wall chestnut-brown, 2–3 μ thick, minutely and moderately echinulate, the pores 2, opposite, usually superequatorial.

III. Telia amphigenous, scattered, round, 0.5–1 mm. across, often confluent and elongate on petioles and veins, 1–5 mm. in length, early naked, somewhat pulverulent, blackish-brown, ruptured epidermis noticeable; teliospores ellipsoid, rarely obovate-ellipsoid, 20–27 by 30–45 μ, rounded or sometimes obtuse at both ends, not constricted at septum; wall dark chestnut-brown, 2–3 μ thick, slightly thickened at apex to 4 μ, minutely and inconspicuously verrucose, markings often arranged in striae; pedicel colorless, deciduous.

ON CARDUACEAE:
Balsamorhiza deltoidea Nutt., California, Idaho, Oregon, Washington.
Balsamorhiza hirsuta Nutt., Idaho.
Balsamorhiza incana Nutt., Montana, Wyoming.
Balsamorhiza macrophylla Nutt., Utah.
Balsamorhiza sagittata (Pursh) Nutt., California, Colorado, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming; British Columbia,
Wyethia amplexicaulis Nutt., Colorado, Utah.
Wyethia angustifolia (DC.) Nutt., California.
Wyethia arizonica A. Gray, Colorado, Utah.
Wyethia mollis A. Gray, California.
TYPE LOCALITY: [Salt Lake City], Utah, on *Balsamorhiza macrophylla*.
DISTRIBUTION: Montana to British Columbia and southward to southern Colorado and central California.
EXSICCATI: Barth. Fungi Columb. *4350, 4454, 4752, 4843;* Barth. N. Am. Ured. *278, 776, 927, 1134, 1223, 1335, 1479, 1530, 1635, 1833, 1977, 2142;* Ellis & Ev. Fungi Columb. *986, 1380, 1870;* Ellis & Ev. N. Am. Fungi *1833, 2987;* Garrett, Fungi Utah, *11, 61, 62, 63, 154;* D. Griff. W. Am. Fungi *245, 245a, b, 271;* Sydow, Ured. *888, 1908, 1909, 1910, 1946*.

53. **Bullaria proba** (Jackson & Holway) Arthur & Mains.

Puccinia proba Jackson & Holway; Arth. Mycologia **10**: 143. 1918.

O. Pycnia epiphyllous, few, gregarious, noticeable, orange becoming brownish, globoid or flask-shaped, 50–65 by 50–80 μ; ostiolar filaments short.

II. Uredinia of the primary form epiphyllous, crowded on slightly raised spots surrounding the pycnia; secondary uredinia chiefly hypophyllous, scattered or gregarious, roundish, small, 0.2–0.4 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores of both forms obovoid or broadly ellipsoid, 16–19 by 20–24 μ; wall colorless or light golden-yellow, 1–1.5 μ, finely and moderately echinulate, the pores 2, equatorial.

III. Telia chiefly hypophyllous, scattered, round, small, 0.2–0.4 mm. across, early naked, pulvinate, chocolate-brown becoming cinereous from germination, ruptured epidermis conspicuous; teliospores ellipsoid or obovate, 16–20 by 26–34 μ, rounded above, rounded or somewhat tapering below, not or slightly constricted at septum; wall in the germinating condition cinnamon- or light chestnut-brown, obscurely verrucose above, smooth below, 1–2 μ thick, in the resting condition chocolate-brown, uniformly and finely verrucose-rugose, 2–3 μ thick, thicker at apex, 3–7 μ by a broad lighter-colored umbo; pedicel colorless, once to once and a half length of spore, or more frequently deciduous.

ON CARDUACEAE:
Zexmenia elegans Schultz-Bip., Guatemala.
Zexmenia frutescens (Mill.) Blake, Costa Rica; Guatemala.
Zexmenia Salvinii Hemsl., Guatemala.
TYPE LOCALITY: Quirigua, Guatemala, on *Zexmenia frutescens*.
DISTRIBUTION: Central America.

54. **Bullaria Enceliae** (Dietel & Holway) Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.

Puccinia Enceliae Dietel & Holway; Holway, Bot. Gaz. **24**: 32. 1897.

O. Pycnia amphigenous, in loose orbicular groups 1–2 mm. across, prominent, honey-yellow becoming light-brown, globoid, 110–150 μ in diameter; ostiolar filaments 100–130 μ long.

II. Uredinia of the primary form amphigenous, oblong, confluent with a ring about the pycnia, prominent, pulvinate, 0.4–0.6 mm. across, dark cinnamon-brown; uredinia of the secondary form hypophyllous, scattered, round, small, 0.3–0.5 mm. across, pulverulent, light cinnamon-brown, ruptured epidermis inconspicuous; urediniospores globoid or obovate-globoid, 18–24 by 20–28 μ; wall cinnamon-brown, moderately thin, 1.5–2 μ, closely and minutely echinulate, the pores 2, equatorial.

III. Telia hypophyllous, scattered, early naked, round, 0.3–0.5 mm. across, pulvinate, blackish-brown, ruptured epidermis inconspicuous; teliospores elliptic or obovate-ellipsoid, 22–29 by 30–42 μ, rounded at both ends, or slightly narrowed below, slightly constricted at septum; wall chestnut-brown, moderately thick, 2–3 μ, thicker above by a broad umbo, 6–9 μ, smooth; pedicel colorless, firm, once to twice length of spore.

ON CARDUACEAE:
Geraea viscida (A. Gray) Blake (*Encelia viscida* A. Gray), California.
Simsia adenophora (Greenm.) Blake (*Encelia adenophora* Greenm.), Jalisco, Oaxaca.
Simsia foetida (Cav.) Blake (*Encelia mexicana* Mart.), Morelos.
Simsia Holwayi Blake, Guatemala.
Simsia polycephala (Hemsl.) Benth. (*Encelia polycephala* Hemsl.), Guatemala.
Simsia sericea (Hemsl.) Blake (*Encelia sericea* Hemsl.), Guatemala.
TYPE LOCALITY: Cuernavaca, Mexico, on *Encelia mexicana*.
DISTRIBUTION: From southern California through Mexico and Central America.
EXSICCATI: Barth. N. Am. Ured. *235, 340, 1240.*

55. **Bullaria Gaillardiae** (Dietel & Holway) Arthur & Mains.

Uredo Gaillardiae Dietel & Holway; Dietel, Erythea **7**: 98. 1899.

O. Pycnia amphigenous, thickly scattered over large areas, punctiform, dark-brown, prominent, globoid, 80–128 μ in diameter; ostiolar filaments 32–55 μ long.

II. Uredinia hypophyllous, loosely scattered from a diffused mycelium, early naked, applanate, round, large, 0.4–0.6 mm. across, moderately pulverulent, cinnamon-brown, ruptured epidermis noticeable; urediniospores globoid or broadly ellipsoid, 24–30 by 28–33 μ, often somewhat flattened on the sides bearing pores; wall cinnamon-brown, moderately thick, 2–3 μ, evenly echinulate, the pores 2, equatorial.

III. Telia unknown.

ON CARDUACEAE:
Gaillardia aristata Pursh, California.
TYPE LOCALITY: Sisson, California, on *Gaillardia aristata*.
DISTRIBUTION: Known only from the type locality.
EXSICCATI: Barth. N. Am. Ured. *1384*.

56. **Bullaria (?) Chrysanthemi** (Roze) Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.

Puccinia Chrysanthemi Roze, Bull. Soc. Myc. Fr. **17**: 92. 1900.
Puccinia Chrysanthemi-chinensis P. Henn. Hedwigia Beibl. **40**: 26. 1901.
Dicaeoma Chrysanthemi Arth. Proc. Ind. Acad. Sci. **1903**: 147. 1904.

O. Pycnia unknown.

II. Uredinia hypophyllous, scattered, round, often confluent, early naked, large, 0.5–1 mm. in diameter, pulverulent, chestnut-brown, ruptured epidermis usually noticeable; urediniospores globoid or broadly ellipsoid, 20–25 by 25–34 μ, sometimes two-celled; wall cinnamon- or chestnut-brown, 1.5–2 μ thick, closely and moderately echinulate, the pores 3, approximately equatorial.

III. Telia hypophyllous, scattered, roundish, 0.3–0.8 mm. across, early naked, pulvinate, dark chocolate-brown, ruptured epidermis noticeable; teliospores elliptic or obovate-ellipsoid, 18–28 by 34–57 μ, rounded or obtuse at both ends, slightly or not constricted at septum; wall chestnut-brown, 1–2 μ thick, thicker above, 5–10 μ, finely and moderately verrucose; pedicel colorless, once to twice length of spore.

ON CARDUACEAE:
Chrysanthemum morifolium Ramat. (*C. sinense* Sabine), Alabama, California, Delaware, Indiana, Maryland, Massachusetts, Michigan, Montana, New Jersey, Oregon, Pennsylvania, Tennessee, West Virginia; Ontario.
TYPE LOCALITY: France, on "*Chrysanthemum indicum*," probably identical with *C. morifolium*.
DISTRIBUTION: In greenhouses in the uredinial form only, quite largely throughout the temperate part of North America; similarly in Europe, Australia, New Zealand, and Japan, telia occurring only in the last named country.
ILLUSTRATIONS: Grove, Brit. Rust Fungi *f. 83, 84;* Centr. Bakt. II. Abth. **10**: 373–376, *f. 1–7;* McAlpine, Rusts Austr. *pl. E. f. 21, pl. 29, f. 251–255;* Rostr. Plantep. Haandb. *f. 94;* Fl. Ital. Crypt. Ured. *f. 54*.
EXSICCATI: Barth. N. Am. Ured. *1431, 1639;* Ellis & Ev. Fungi Columb. *1956, 2052;* Rel. Farl. *246*.

57. **Bullaria Absinthii** (Hedw. f.) Arthur & Mains.

Uredo (*Puccinia*) *Absinthii* Hedw. f.; Poir, in Lam. Encyc. **8**: 245. 1808.
Puccinia Absinthii DC. Fl. Fr. **6**: 56. 1815.
Puccinia Artemisiarum Schmidt & Kuntze, Deuts. Schwämme **4**: 5. 1816.
Caeoma Artemisiae Link, in Willd. Sp. Pl. **6**^{2}: 19. 1825.
Puccinia discoidearum Artemisiarum Wallr. Fl. Crypt. Germ. **2**: 222. 1833.
Uredo Artemisiae Rab. Deutschl. Krypt.-Fl. **1**: 12. 1844.
Caeoma Absinthii Corda, Ic. Fung. **6**: 1. 1854.
Trichobasis Artemisiae Berk.; Cooke, Micr. Fungi 209. 1865.
Puccinia Artemisiae Fuckel, Jahrb. Nass. Ver. Nat. **23–24**: 55. 1870.
Puccinia similis Ellis & Ev. Bull. Torrey Club **25**: 508. 1898.
Puccinia artemisiella Sydow, Monog. Ured. **1**: 14. 1902.

O. Pycnia not seen.

II. Uredinia chiefly hypophyllous, scattered, round, 0.3–0.5 mm. across, early naked, pulverulent, dark cinnamon-brown, ruptured epidermis noticeable; urediniospores obovate or ellipsoid, 20–26 by 24–34 μ; wall golden-brown, 1.5–2.5 μ, minutely and moderately echinulate, the pores 3, equatorial.

III. Telia chiefly hypophyllous, scattered, round or oblong, 0.5–1 mm. across, early naked, pulverulent, dark chocolate-brown or blackish, ruptured epidermis usually inconspicuous; teliospores ellipsoid or oblong, 20–28 by 40–60 μ, obtuse or rounded above, usually somewhat narrowed below, scarcely constricted at septum; wall chestnut-brown, minutely rugose, especially above, or smooth, moderately thick, 1.5–2.5 μ, thickened above, 6–12 μ, concolorous; pedicel nearly colorless, thick, 6–10 μ, once to once and a half length of spore.

ON CARDUACEAE:
Artemisia arbuscula Nutt., Wyoming.
Artemisia aromatica A. Nelson, Colorado, Idaho, Montana, Utah, Wyoming.

Artemisia Bigelovii A. Gray, Utah.
Artemisia Brittonii Rydb., Colorado.
Artemisia californica Less., California.
Artemisia camporum Rydb., Colorado.
Artemisia cana Pursh, Colorado, Montana, New Mexico, North Dakota, Oregon, South Dakota, Utah, Wyoming.
Artemisia cana viscidula Osterhout, Colorado.
Artemisia coloradensis Osterhout, Colorado.
Artemisia diversifolia Rydb., Colorado.
Artemisia Douglasiana Bess., California, Oregon.
Artemisia dracunculoides Pursh, Arizona, California, Colorado, Iowa, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, Wisconsin.
Artemisia elatior (T. & G.) Rydb., California.
Artemisia frigida Willd., Oregon; Alberta.
Artemisia gnaphalodes Nutt., Colorado, Iowa, Kansas, Missouri, Montana, Nebraska, Oklahoma, Oregon.
Artemisia heterophylla Nutt., California.
Artemisia kansana Britton, Texas.
Artemisia longifolia Nutt., South Dakota.
Artemisia ludoviciana Nutt., Arizona, California, Colorado, Kansas, Montana, Nebraska, North Dakota, Oregon, South Dakota, Washington, Wisconsin; British Columbia.
Artemisia mexicana Willd., Texas; Chihuahua, Mexico (state).
Artemisia nova A. Nelson, New Mexico, Utah.
Artemisia Parishii A. Gray, Nevada.
Artemisia Purshiana Bess., Montana.
Artemisia pycnocephala DC., California.
Artemisia redolens A. Gray, New Mexico; Chihuahua.
Artemisia rigida (Nutt.) A. Gray, California, Oregon, Washington.
Artemisia serrata Nutt., Iowa.
Artemisia silvicola Osterhout, New Mexico.
Artemisia spinescens D. C. Eaton, Idaho.
Artemisia Suksdorfii Piper, California.
Artemisia tridentata Nutt., California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, South Dakota, Utah, Washington, Wyoming.
Artemisia tripartita Rydb., Idaho, Wyoming.
Artemisia viscidula Osterhout, Colorado.
Artemisia vulgaris L., Costa Rica.
Artemisia Wrightii A. Gray, Arizona, New Mexico.
Sphaeromeria capitata Nutt., Wyoming.
Sphaeromeria diversifolia (D. C. Eaton) Rydb., Utah.

TYPE LOCALITY: Vicinity of Mende, France, on *Artemisia Absinthium*.

DISTRIBUTION: North Dakota to Wisconsin and Texas, westward to the Pacific coast, and southward through Central America; also in Europe.

ILLUSTRATIONS: Corda, Ic. Fung. **4**: *pl. 4, f. 43;* Grove, Brit. Rust Fungi *f. 86;* Beitr. Krypt. Schweiz 2^2: *f. 148;* Fl. Ital. Crypt. Ured. *f. 52a.*

EXSICCATI: Barth. Fungi Columb. *2346, 2445, 2753, 3737, 3738, 4252, 4253, 4346, 4450, 4561, 4838, 4947, 5046, 5047, 5048;* Barth. N. Am. Ured. *16, 221, 321, 322, 725, 726, 921, 1020, 1021, 1022, 1216, 1324, 1325, 1517, 1629, 1738, 1739, 1826, 1827, 1828, 2026, 2027, 2127, 2128, 2129, 2222, 2421;* Brenckle, Fungi Dak. *418;* Clements, Crypt. Form. Colo. *544;* Ellis & Ev. Fungi Columb. *754b' 1665, 1757, 1844, 2050, 2140;* Ellis & Ev. N. Am. Fungi *1848 a, b, 2250;* Garrett, Fungi Utah. *79, 80, 181;* D. Griff. W. Am. Fungi *86, 86a, 248, 261, 354, 354b;* Sydow, Ured. *836, 886, 1706, 1964.*

58. **Bullaria Cirsii** (Lasch) Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.

Puccinia Cirsii Lasch; Rab. Fungi Eur. *89.* 1859.
Uredo Cirsii Lasch; Rab. Fungi Eur. *90.* 1859.
Puccinia californica Dietel, Bot. Gaz. **18**: 254. 1893.
Puccinia Laschii Lagerh. Tromsö Mus. Aarsh. **17**: 63. 1895.
Puccinia inclusa Sydow, Monog. Ured. **1**: 56. 1902.

O. Pycnia chiefly epiphyllous, crowded in small groups, inconspicuous, punctiform, immersed, dark golden-brown, globoid, 100–135 μ broad; ostiolar filaments 30–40 μ long, free, becoming agglutinate.

II. Uredinia amphigenous, chiefly hypophyllous, scattered or gregarious, or at first encircling the pycnia, round, usually small, 0.3–1 mm. across, early naked, pulverulent, light chestnut-brown, ruptured epidermis generally inconspicuous; urediniospores globoid or globose, 22–28 by 24–32 μ; wall golden-brown, moderately thick, 1.5–2.5 μ, sparsely or moderately and minutely echinulate, the pores 3, rarely 4, equatorial.

III. Telia amphigenous, chiefly hypophyllous, irregularly scattered or occasionally gregarious, round, usually small, 0.3–1 mm. across, early naked, somewhat pulverulent, dark chestnut-brown, ruptured epidermis generally inconspicuous; teliospores broadly ellipsoid,

22–28 by 28–45 μ, rounded at both ends, not constricted at septum; wall chestnut-brown, 1.5–2.5 μ thick, closely and minutely verrucose with markings often arranged in longitudinal lines, or nearly smooth, very slightly or not thickened at apex, the pores of either cell usually depressed one third; pedicel colorless, fragile, usually very short, rarely equaling the spore.

ON CARDUACEAE:

Cirsium acaulescens (A. Gray) K. Schumann (*C. americanum* K. Schumann, *Carduus acaulescens* Rydb., *C. Drummondii acaulescens* Coville, *Cnicus Drummondii acaulescens* A. Gray), California, Colorado, Oregon, Utah.
Cirsium altissimum (L.) Spreng. (*Carduus altissimus* L., *Cnicus altissimus* Willd.), Delaware, Iowa, Kansas, Minnesota, Missouri, Nebraska, Pennsylvania, South Dakota.
Cirsium arizonicum (A. Gray) Petrak (*Carduus arizonicus* Greene, *Cnicus arizonicus* A. Gray), Arizona, New Mexico.
Cirsium Breweri (A. Gray) Jepson (*Cnicus Breweri* A. Gray), California, Washington.
Cirsium californicum A. Gray (*Carduus californicus* Greene), California.
Cirsium canescens Nutt., Colorado.
Cirsium Centaureae (Rydb.) K. Schumann (*Carduus Centaureae* Rydb., *C. americanus* Greene), Colorado.
Cirsium coloradense (Rydb.) Cockerell (*Carduus coloradensis* Rydb.), New Mexico.
Cirsium discolor (Muhl.) Spreng. (*Carduus discolor* Nutt., *Cnicus discolor* Muhl.), Iowa, New Jersey, Oklahoma.
Cirsium Drummondii T. & G. (*Carduus Drummondii* Coville, *Cnicus Drummondii* A. Gray), Colorado, Nevada, Utah, Wyoming.
Cirsium Eatoni (A. Gray) B. L. Robinson (*Carduus leiocephalus* A. Heller), Utah.
Cirsium edule Nutt. (*Carduus edulis* Greene, *Cnicus edulis* A. Gray), California, Oregon, Washington.
Cirsium Flodmannii (Rydb.) Arth. (*Carduus Flodmannii* Rydb.), North Dakota.
Cirsium foliosum (Hook.) DC., Idaho.
Cirsium griseum (Rydb.) K. Schumann, Colorado.
Cirsium Hookerianum Nutt. (*Carduus Hookerianus* A. Heller), Montana.
Cirsium inornatum Wooton & Standley, New Mexico.
Cirsium lanceolatum (L.) Hill (*Carduus lanceolatus* L., *Cnicus lanceolatus* Willd.), Louisiana, Montana, Wisconsin.
Cirsium lomatolepis (Hemsl.) Petrak (*Cnicus lomatolepis* Hemsl.), Mexico (state).
Cirsium megacephalum (A. Gray) Cockerell (*Carduus undulatus megacephalus* Greene, *Cnicus undulatus megacephalus* A. Gray), Colorado, Nebraska, Oklahoma.
Cirsium Nelsonii (Pammel) Rydb. (*Cnicus Nelsonii* Pammel, *Carduus Nelsonii* Pammel), Wyoming.
Cirsium neomexicanum A. Gray (*Carduus neomexicanus* Greene), Colorado.
Cirsium ochrocentrum A. Gray (*Carduus ochrocentrus* Greene, *Cnicus ochrocentrus* A. Gray), Colorado, New Mexico, Wyoming.
Cirsium occidentale (Nutt.) Jepson (*Carduus occidentalis* Nutt., *Cnicus occidentalis* A. Gray), California.
Cirsium oreophilum Rydb. (*Carduus oreophilus* Rydb.), Colorado.
Cirsium palousense Piper, Idaho.
Cirsium pallidum Wooton & Standley, New Mexico.
Cirsium Parryi (A. Gray) Petrak (*Cnicus Parryi* A. Gray), Colorado.
Cirsium perennans (Greene) Wooton & Standley, New Mexico.
Cirsium perplexans Rydb. (*Carduus americanus perplexans* A. Nelson), Colorado.
Cirsium plattense (Rydb.) Cockerell (*Carduus plattensis* Rydb.), Colorado, Nebraska.
Cirsium pulchellum (Greene) Wooton & Standley (*Carduus pulchellus* Greene), Utah.
Cirsium quercetorum (A. Gray) Jepson (*Cnicus quercetorum* A. Gray), California.
Cirsium remotifolium (Hook.) DC. (*Carduus remotifolius* Hook.), Washington.
Cirsium scopulorum (Greene) Cockerell (*C. eriocephalum* A. Gray, *Cnicus eriocephalus* A. Gray, *Carduus scopulorum* Greene), Colorado, Montana, Wyoming.
Cirsium spathulifolium Rydb. (*Carduus spathulatus* Osterhout), Colorado.
Cirsium Tracyi Rydb. (*Carduus Tracyi* Rydb.), Colorado.
Cirsium undulatum (Nutt.) Spreng. (*Carduus undulatus* Nutt., *Cnicus undulatus* A. Gray, *C. undulatus Douglasii* Greene), California, Colorado, Indiana, Kansas, Montana, New Mexico, Oregon, South Dakota, Utah; Alberta.
Cirsium vernale (Osterhout) Cockerell (*Carduus vernalis* Osterhout), Colorado.
Cirsium virginianum (L.) Michx. (*Carduus virginianus* L., *Cnicus virginianus* Pursh), North Carolina.
Cirsium Wrightii A. Gray (*Carduus Wrightii* A. Heller), Arizona.
Cirsium sp., Texas; Michoacan, Oaxaca; Costa Rica.

TYPE LOCALITY: Near Driesen, Germany, on *Cirsium oleraceum*.

DISTRIBUTION: Alberta and North Dakota southward to Louisiana and Costa Rica, as well as from New Jersey and North Carolina westward to Minnesota and Missouri, being especially abundant in the western mountains; also in Europe and Asia.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2^2: *f. 168–171;* Ber. Deuts. Bot. Ges. 11: *pl. 21, f. 31–33, 40–48;* Zeits. Pflanzenkr. 9: 287, *f. 9–12;* Grove, Brit. Rust Fungi *f. 94, 95.*

EXSICCATI: Barth. Fungi Columb. *2353, 2757, 3549, 3652, 3747, 3748, 4055, 4352, 4566;* Barth. N. Am. Ured. *28, 131, 132, 230, 537, 629, 735, 934, 935, 1034, 1035, 1143, 1227, 1340, 1750, 2345;* Brenckle, Fungi Dakot. *64;* Clements, Crypt. Form. Colo. *318, 553;* Ellis & Ev. Fungi Columb. *1571, 2142;* Ellis & Ev. N. Am. Fungi *2253, 2254;* Garrett, Fungi Utah. *69, 93, 132;* D. Griff. W. Am. Fungi *356;* Seym. & Earle, Econ. Fungi *306;* Sydow, Ured. *1581, 1772, 2269;* Zahlbr. Krypt. *2010.*

59. **Bullaria suaveolens** (Pers.) Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.

Uredo suaveolens Pers. Obs. Myc. **2**: 24. 1799.
Uredo Serratulae Schum. Enum. Pl. Saell. **2**: 231. 1803.
Hypodermium (*Uredo*) *obtegens* Link, Ges. Nat. Freunde Berlin Mag. **7**: 27. 1815.
Caeoma suaveolens Schlecht. Fl. Berol. **2**: 127. 1824.
Erysibe suaveolens Wallr. Fl. Crypt. Germ. **2**: 206. 1833.
Sphaeronema Cirsii Lasch, Bot. Zeit. **4**: 878. 1846.
Puccinia obtegens Tul. Ann. Sci. Nat. Bot. IV, **2**: 87. 1854.
Trichobasis suaveolens Lév.; Berk. Outl. Brit. Fung. 332. 1860.
Puccinia suaveolens Rostr. Forh. Skand. Nat. **11**: 339. 1874.
Aecidiolum Cirsii Sacc. Michelia **1**: 12. 1877.
Dicaeoma suaveolens Kuntze, Rev. Gen. **3**^{3}: 470. 1898.

O. Pycnia hypophyllous or epicostal and caulicolous, scattered evenly over large areas preceding or accompanying the primary uredinia, conspicuous, punctiform, globoid or somewhat conic, 90–185 μ broad, two thirds as high; pycniospores elliptic, 1 by 3 μ.

II. Uredinia of the primary form hypophyllous and caulicolous, round, 0.3–0.5 mm. across, scattered evenly over large areas, often confluent, early naked, pulverulent, chestnut-brown, ruptured epidermis conspicuous; uredinia of the secondary form scattered or gregarious; urediniospores globoid or broadly ellipsoid, 22–26 by 24–28 μ; wall thin, 1–1.5 μ, cinnamon-brown, closely and minutely echinulate, the pores 3, equatorial.

III. Telia hypophyllous and caulicolous, round, 0.3–0.5 mm. across, evenly scattered over large areas or somewhat gregarious, coalescing, or occasionally irregularly scattered, early naked, pulverulent, chestnut-brown, ruptured epidermis conspicuous; teliospores ellipsoid, 20–24 by 30–38 μ, rounded at both ends, slightly constricted at septum; wall light chestnut-brown, uniformly thin, 1.5–2 μ, closely and finely verrucose, the pore of lower cell half way between septum and base; pedicel colorless, fragile, short.

ON CARDUACEAE:
Cirsium arvense (L.) Scop. (*Carduus arvensis* Robson, *Cnicus arvensis* Hoffm., *Serratula arvensis* L.), Maine, Massachusetts, Michigan, New Jersey, New York, Pennsylvania, Rhode Island, South Dakota, Utah, Vermont, Wisconsin; Nova Scotia, Ontario, Quebec.

TYPE LOCALITY: Europe, on *Serratula arvensis*.

DISTRIBUTION: New Jersey to South Dakota northward into Canada, and in Utah; also in Europe and Japan.

ILLUSTRATIONS: Zeits. Pflanzenkr. 9: 292, *f. 17;* Grove, Brit. Rust Fungi *f. 97*.

EXSICCATI: Barth. Fungi Columb. *3562, 3854, 4155;* Barth. N. Am. Ured. *855, 1358, 1664, 1957;* Ellis & Ev. Fungi Columb. *484;* Ellis, N. Am. Fungi *1056;* Seym. & Earle, Econ. Fungi *303a–d, 304*.

60. **Bullaria Cyani** (Schleich.) Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.

Uredo Cyani Schleich. (Pl. Crypt. Helv. *95*, hyponym. 1805); DC. Fl. Fr. **6**: 74. 1815.
Puccinia Cyani Pass.; Rab. Fungi Eur. *1767*. 1873.

O. Pycnia not seen.

II. Uredinia amphigenous or chiefly hypophyllous and caulicolous, scattered over wide areas evidently from a distributed mycelium, round or elliptic, 0.2–0.8 mm. across, early naked, pulverulent, dark cinnamon-brown, ruptured epidermis noticeable; urediniospores globoid or broadly ellipsoid, 20–24 by 22–26 μ; wall cinnamon-brown, 1.5–2 μ, closely and minutely echinulate, the pores 2, opposite and equatorial.

III. Telia amphigenous and caulicolous, scattered over wide areas, round, 0.2–0.5 mm. across or somewhat elongate, early naked, somewhat pulverulent, dark chestnut-brown, ruptured epidermis noticeable; teliospores broadly ellipsoid, 24–28 by 32–40 μ, rounded at each end, not constricted at septum; wall chestnut-brown, uniformly 1.5–3 μ thick, minutely and closely verrucose, the apical pore usually depressed about one third toward septum, the pore of lower cell about midway between septum and pedicel; pedicel colorless, deciduous.

ON CARDUACEAE:
Centaurea Cyanus L., Delaware, Massachusetts, New Jersey, New York, Oregon, Pennsylvania.

TYPE LOCALITY: Switzerland, on *Centaurea Cyanus*.

DISTRIBUTION: Delaware to central Pennsylvania and in Oregon; also in Europe.

ILLUSTRATIONS: Corda, Ic. Fung. **4**: *pl. 5, f. 65;* Ber. Deuts. Bot. Ges. **11**: *pl. 21, f. 20–22;* Zeits. Pflanzenkr. 9: 293, *f. 18*.

EXSICCATI: Barth. Fungi Columb. *3353*.

61. **Bullaria irrequisita** (H. S. Jackson) Arthur & Mains.

Puccinia irrequisita H. S. Jackson; Arth. Bull. Torrey Club **48**: 32. 1921.

O. Pycnia unknown.

II. Uredinia amphigenous, scattered, round, 0.3–0.5 mm. across, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; urediniospores globoid or broadly ellipsoid, 20–23 by 23–26 μ; wall cinnamon-brown, 1–1.5 μ thick, moderately and finely echinulate, the pores 3, equatorial.

III. Telia amphigenous, chiefly epiphyllous, scattered, round, 0.3–0.5 mm. across, tardily naked, pulvinate, blackish-brown, or grayish from the overlying epidermis; teliospores irregularly ellipsoid, somewhat angular, 24–29 by 34–40 μ, rounded or obtuse above, rounded or truncate below, scarcely constricted at septum; wall chestnut-brown, 3–3.5 μ thick, not appreciably thickened above, obscurely and very finely verrucose; pedicel colorless, short, deciduous.

ON CARDUACEAE:
Centaurea americana Nutt., Texas.
TYPE LOCALITY: Austin, Texas, on *Centaurea americana*.
DISTRIBUTION: Known only from the type locality.
EXSICCATI: Barth. N. Am. Ured. *1338;* Ellis & Ev. Fungi Columb. *1642*.

62. **Bullaria Carthami** (Corda) Arthur & Mains.

Puccinia Carthami Corda, Ic. Fung. **4**: 15. 1840.
Dicaeoma Carthami Huzelm.; Opiz, Seznam 139, as synonym. 1852.
Dicaeoma Carthami Kuntze, Rev. Gen. **3**^{3}: 468. 1898.

O. Pycnia unknown.

II. Uredinia amphigenous, scattered, round, small, 0.2–0.4 mm. across, early naked, pulverulent, chestnut-brown, ruptured epidermis evident; urediniospores globose, globoid, or broadly ellipsoid, 17–23 by 22–26 μ; wall thin, 1.5–2 μ, light chestnut-brown, finely echinulate, the pores 3, rarely 4, equatorial.

III. Telia amphigenous, largely hypophyllous, scattered, round, 0.3–0.5 mm. across, early naked, pulverulent, blackish-brown, ruptured epidermis conspicuous; teliospores broadly ellipsoid, 23–29 by 32–42 μ, rounded or somewhat obtuse above and below, not or only slightly constricted at septum; wall chestnut-brown, uniformly 2–3 μ thick, closely and inconspicuously verruculose, the pore usually depressed from one third to one half length of each cell; pedicel colorless, delicate, fragile, mostly deciduous.

ON CARDUACEAE:
Carthamus tinctorius L., Massachusetts.
TYPE LOCALITY: Prag, Bohemia, on *Carthamus tinctorius*.
DISTRIBUTION: Cottage City, Massachusetts; also in Europe, northern Africa, India, and Japan.
ILLUSTRATION: Corda, Ic. Fung. **4**: *pl. 4, f. 52*.

63. **Bullaria Bardanae** (Corda) Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.

Uredo apiculata Arctii Strauss, Ann. Wett. Ges. **2**: 98. 1810.
Puccinia inquinans Bardanae Wallr. Fl. Crypt. Germ. **2**: 219. 1833.
Puccinia Bardanae Corda, Ic. Fung. **4**: 17. 1840.
Puccinia Lappae Cast. Cat. Pl. Mars. 201. 1845.
Puccinia punctata Bon. Abh. Nat. Ges. Halle **5**: 220. 1860.

O. Pycnia epiphyllous, numerous, gregarious, noticeable, honey-yellow, conic, 130–160 by 95–125 μ; ostiolar filaments to 40 μ in length.

II. Uredinia of the primary sort epiphyllous, surrounding the pycnia; uredinia of the secondary sort amphigenous, scattered, small, round, 0.2–0.5 mm. across, early naked, pulverulent, chestnut-brown, ruptured epidermis noticeable; urediniospores globoid or broadly ellipsoid, 23–26 by 24–30 μ; wall 1.5–2 μ thick, light chestnut-brown, finely and moderately echinulate, the pores 3, equatorial.

III. Telia amphigenous, chiefly hypophyllous, scattered or gregarious, small, round, 0.2–0.5 mm. across, early naked, somewhat pulverulent, blackish-brown, ruptured epidermis not conspicuous; teliospores broadly ellipsoid, 23–26 by 34–38 μ, rounded at apex and base,

scarcely constricted at septum; wall chestnut-brown, 1.5–2.5 μ thick, slightly or not thickened over pores, the pore of upper cell usually depressed, that of the lower cell half way between septum and pedicel, closely and minutely verrucose; pedicel colorless, usually deciduous.

ON CARDUACEAE:
Arctium minus Schlecht., Illinois, Indiana, Massachusetts, Michigan, Missouri, New York, North Dakota, Pennsylvania, Virginia, West Virginia, Wisconsin; Nova Scotia, Ontario.
TYPE LOCALITY: Prag, Bohemia, on *Arctium Bardana*.
DISTRIBUTION: Virginia to Missouri and northward and northeastward into Canada; also in Europe.
ILLUSTRATIONS: Corda, Ic. Fung. 4: *pl. 5, f. 63;* Beitr. Krypt. Schweiz 2^2: *221, f. 173;* Zeits. Pflanzenkr. 9: 291, *f. 15;* Grove, Brit. Rust Fungi *f. 90*.
EXSICCATI: Barth. Fungi Columb. *4952;* Barth. N. Am. Ured. *1224, 1636, 1936, 2232, 2342, 2539, 2540;* Rel. Farl. *243*.

64. **Bullaria chondrillina** (Bubák & Sydow) Arthur & Mains.

Uredo Chondrillae Opiz, Seznam 151, hyponym. 1852.
Puccinia chondrillina Bubák & Sydow, Oesterr. Bot. Zeits. **51**: 17. 1901.

O. Pycnia amphigenous, honey-yellow, grouped among the primary uredinia, soon disappearing.

II. Uredinia of the primary form in large, circular or irregular groups, otherwise similar to the secondary form; secondary uredinia amphigenous or caulicolous, numerous, scattered or sometimes crowded on stems into elongate groups, round or irregular, 0.2–0.6 mm. in diameter, rather tardily naked, pulverulent, dark cinnamon-brown, ruptured epidermis conspicuous; urediniospores of both forms obovoid or ellipsoid, 16–23 by 23–29 μ; wall cinnamon-brown, 1–1.5 μ, usually 1 μ thick, finely, closely and inconspicuously echinulate, the pores 2, superequatorial.

III. Telia amphigenous or caulicolous, scattered or crowded in groups of several sori, round or irregularly elongate, 0.2–0.8 mm. across, rather early naked, pulvinate, chestnut-brown, ruptured epidermis evident; teliospores ellipsoid or oblong, 19–23 by 30–39 μ, usually rounded above and below, slightly constricted at septum; wall dark cinnamon- or light chestnut-brown, of uniform thickness, thin, 1 μ or less, very finely and closely verrucose, noticeable only when dry, the pore in upper half of each cell; pedicel hyaline, as long as spore or shorter, fragile.

ON CICHORIACEAE:
Chondrilla juncea L., District of Columbia, Maryland, Virginia.
TYPE LOCALITY: Bohemia, on [*Chondrilla* sp. ?].
DISTRIBUTION: Northern Virginia to District of Columbia; also in Europe.
ILLUSTRATIONS: Krypt.-fl. Brand. Pilze **3**: *f. B74*.

65. **Bullaria Hieracii** (Schum.) Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.

Uredo Hieracii Schum. Enum. Pl. Saell. **2**: 232. 1803.
Uredo Hyoseridis Schum. Enum. Pl. Saell. **2**: 233. 1803.
Puccinia Phaseoli Taraxaci Rebent, Prodr. Fl. Neom. 356. 1804.
Uredo Cichoracearum DC. Fl. Fr. **2**: 229. 1805.
Uredo flosculosorum Hieracii Strauss, Ann. Wett. Ges. **2**: 102. 1811.
Puccinia Hieracii H. Mart. Fl. Mosq. 226. 1812.
Puccinia flosculosorum Hieracii Röhling, Deuts. Fl. ed. 2. **3**: 131. 1813.
Uredo Cichorii DC. Fl. Fr. **6**: 74. 1815.
Puccinia Compositarum Schlecht. Fr. Berol. **2**: 133. 1824.
Caeoma Cichorii Link, in Willd. Sp. Pl. 6^2: 18. 1825.
Puccinia Cichorii Bellynck; Kickx. Fl. Crypt. Fland. **2**: 65. 1867.
Puccinia rugosa Billings, in S. Wats. Bot. King's Expl. 414. 1871.
Puccinia Hypochaeridis Oud. Nederl. Kruidk. Arch. II. **1**: 175. 1872.
Puccinia Endiviae Pass.; Thüm. Hedwigia **12**: 113. 1873.
Puccinia Troximontis Peck, Bot. Gaz. **6**: 227. 1881.
Puccinia Taraxaci Plowr. Brit. Ured. 186. 1889.
Dicaeoma Hieracii Kuntze, Rev. Gen. 3^3: 469. 1898.
Dicaeoma Taraxaci Kuntze, Rev. Gen. 3^3: 470. 1898. Not *D. Taraxaci* Kuntze, *loc. cit.* 467. 1898.
Dicaeoma Troximontis Kuntze, Rev. Gen. 3^3: 471. 1898.
Puccinia Leontodontis Jacky, Zeits. Pflanzenkr. **9**: 339. 1899.
Puccinia Crepidis-acuminatae Sydow, Oesterr. Bot. Zeits. **51**: 27. 1901.
Puccinia Krigiae Sydow, Monog. Ured. **1**: 104. 1902.
Puccinia Pyrrhopappi Sydow, Monog. Ured. **1**: 138. 1902.
Puccinia sejuncta Sydow, Ann. Myc. **1**: 326. 1903.

Dicaeoma sejunctum Arth. Résult. Sci. Congr. Bot. Vienne 344. 1906.
Bullaria Taraxaci Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.

O. Pycnia amphigenous, crowded in groups 0.8–2 mm. in diameter, noticeable, honey-yellow becoming chocolate-brown, flattened-globoid or globoid, 60–135 μ wide by 50–112 μ high; ostiolar filaments 25–80 μ long, often projecting beyond the ostiole and agglutinate into a column.

II. Uredinia of the primary form circinating about the pycnia, otherwise similar to the secondary form; secondary uredinia amphigenous or caulicolous, scattered or somewhat crowded in groups, round or oblong, 0.2–1 mm. in diameter or up to 2 mm. long, early or somewhat tardily naked, pulverulent, dark cinnamon- or golden-brown, ruptured epidermis conspicuous; urediniospores of both forms broadly ellipsoid, globoid, or obovoid, 17–28 by 21–32 μ; wall cinnamon-brown, 1–2.5 μ thick, moderately or closely echinulate, the pores 2 or sometimes 3, superequatorial or equatorial.

III. Telia amphigenous or caulicolous, scattered or somewhat grouped, round or oblong, 0.2–1 mm. across, early or somewhat tardily naked, sometimes pulvinate, pulverulent, chocolate-brown, ruptured epidermis conspicuous; teliospores ellipsoid or oblong, 18–29 by 26–42 μ, rounded above and below, not or slightly constricted at septum; wall chestnut-brown, uniform in thickness, 1–2.5 μ, closely or moderately and finely verrucose, the pore of the upper cell usually in upper half, of the lower cell variable; pedicel colorless, fragile.

ON CICHORIACEAE:

Adopogon virginicus (L.) Kuntze (*Cynthia virginica* D. Don, *Krigia amplexicaulis* Nutt.), North Carolina.
Agoseris agrestis Osterhout (*A. Leontodon* Rydb.), Utah.
Agoseris aurantiaca (Hook.) Greene (*Troximon aurantiacum* Hook.), Colorado, Washington.
Agoseris barbellulata Greene (*Troximon barbellulata* Greene), California.
Agoseris elata (Nutt.) Greene, Washington.
Agoseris glauca (Nutt.) Greene (*Troximon glaucum* Nutt.), Arizona, Colorado, Montana, Wyoming.
Agoseris gracilens (A. Gray) Kuntze (*Troximon gracilens* A. Gray), Colorado, Utah, Washington.
Agoseris graminifolia Greene (*Troximon gracilens Greenei* A. Gray), Colorado.
Agoseris grandiflora (Nutt.) Greene (*Troximon grandiflorum* A. Gray), Montana, Washington.
Agoseris heterophylla (Nutt.) Greene (*Troximon heterophyllum* Greene), Washington.
Agoseris hirsuta (Hook.) Greene (*Troximum humile* A. Gray), California.
Agoseris laciniata (Nutt.) Greene (*Troximon arachnoideum* A. Nelson), Oregon.
Agoseris leptocarpa Osterhout, Colorado.
Agoseris montana Osterhout, Colorado.
Agoseris plebia Greene, California.
Agoseris purpurea (A. Gray) Greene (*Troximon aurantiacum purpureum* A. Gray), Colorado, Wyoming.
Agoseris turbinata Rydb., Montana.
Agoseris villosa Rydb. (*Troximon villosum* A. Nelson), Montana.
Agoseris sp., British Columbia.
Apargia autumnalis (L.) Hoffm. (*Leontodon autumnale* L.), Maine; Nova Scotia.
Cichorium Endivia L., Connecticut.
Cichorium Intybus L., New York, Oregon, Vermont, Washington, Wisconsin; Nova Scotia, Ontario, Quebec; Bermuda.
Crepis acuminata Nutt., California, Colorado, Idaho, Montana, Nevada, Utah, Washington, Wyoming.
Crepis angustata Rydb., British Columbia.
Crepis glauca (Nutt.) T. & G., Utah.
Crepis gracilis (D. C. Eaton) Rydb., Idaho.
Crepis intermedia A. Gray, California, Colorado, Utah, Wyoming.
Crepis occidentalis Nutt., Colorado, Nevada, Utah.
Crepis pleurocarpa A. Gray, California.
Crepis runcinata (James) T. & G., Montana, North Dakota, Washington.
Crepis scopulorum Coville, Colorado, Idaho.
Crepis subacaulis (Kellogg) Coville (*C. occidentalis subacaulis* Kellogg), California, Utah.
Heteropleura Fendleri (Schultz-Bip.) Rydb. (*Hieracium Fendleri* Schultz-Bip.), Arizona, New Mexico.
Hieracium albiflorum Hook., Idaho, Montana, Oregon, Washington.
Hieracium canadense Michx., Connecticut, Illinois, Indiana, Iowa, Maine, Massachusetts, Michigan, Montana, Rhode Island, Washington, Wisconsin, Wyoming; Ontario, Quebec.
Hieracium cinereum Howell, Oregon.
Hieracium columbianum Rydb., Idaho, Montana, Washington.
Hieracium gracile Hook., Oregon.
Hieracium gracile detonsum A. Gray, California.
Hieracium griseum Rydb., Utah.

Hieracium Gronovii L., New York.
Hieracium horridum Fries, California.
Hieracium scabrum Michx., Delaware, Indiana, Maine, New York, Pennsylvania, Virginia, West Virginia; Nova Scotia.
Hieracium Scouleri Hook., Oregon, Washington.
Hieracium umbellatum L., North Dakota, South Dakota.
Hieracium sp., Mexico (state); Guatemala.
Hypochaeris glabra L., California.
Hypochaeris radicata L., California, Oregon.
Leontodon dumetorum (Greene) Rydb. (*Taraxacum dumetorum* Greene), Colorado.
Leontodon erythrospermum (Andrz.) Eichw. (*Taraxacum erythrospermum* Andrz.), Indiana, Maine, Nebraska, North Dakota, Ohio.
Leontodon Taraxacum L. (*Taraxacum officinale* Weber, *T. Dens-leonis* Desf., *T. Taraxacum* Karst.), Alaska, California, Colorado, Delaware, Florida, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Jersey, New Mexico, New York, North Dakota, Ohio, Oregon, Pennsylvania, South Dakota, Tennessee, Utah, Virginia, Washington, West Virginia, Wisconsin, Wyoming; British Columbia, Nova Scotia, Ontario, Quebec, Saskatchewan.
Nothocalais cuspidata (Pursh) Greene (*Troximon cuspidatum* Pursh), Colorado, Iowa, Nebraska.
Ptilocalais graciloba (Kellogg) Greene (*Microseris major laciniata* A. Gray), Utah.
Ptilocalais macrolepis Rydb., Utah.
Ptilocalais major (A. Gray) Greene (*Microseris major* A. Gray), Utah.
Ptilocalais nutans (Geyer) Greene (*Microseris nutans* A. Gray), California, Idaho.
Ptilocalais tenuifolia Osterhout, Utah.
Sitilias caroliniana (Walt.) Raf. (*Pyrrhopappus carolinianus* DC.), Arkansas, Florida. Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas.
Sitilias grandiflora (Nutt.) Greene (*Pyrrhopappus scaposus* DC.), Arizona, Kansas, Oklahoma, Texas.
Sitilias multicaulis (DC.) Greene (*Pyrrhopappus multicaulis* DC.), Texas.
Uropappus Lindleyi (DC.) Nutt. (*Microseris Lindleyi* DC.), California.

TYPE LOCALITY: Island of Zealand, Denmark, on *Hieracium sylvaticum*.

DISTRIBUTION: United States and southern Canada, southward into Guatemala; also throughout the temperate and subtropical zones of the world.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2^2: *f. 178, 179, 181, 182;* Krypt.-fl. Brand. Pilze **3**: *f. B72, B75, B76a, B80, B81;* Ann. Rep. N. Y. State Mus. **25**: *pl. 2, f. 6;* Fl. Ital. Crypt. Ured. *f. 56;* Grove, Brit. Rust Fungi *f. 100–102, 106*.

EXSICCATI: Barth. Fungi Columb. *2778, 2968, 3064, 3167, 3178, 3269, 3270, 3356, 3373, 3468, 3770, 3771, 3933, 3944, 3972, 4164, 4372;* Barth. N. Am. Ured. *34, 242, 371, 468, 470, 472, 540, 565, 575, 664, 667, 768, 850, 868, 869, 1253, 1273, 1351, 1375, 1452, 1473, 1669, 1778, 1840, 1851, 1874, 1970, 2073, 2169, 2234, 2251, 2270, 2369, 2429, 2449;* Brenckle, Fungi Dak. *68, 463;* Carleton, Ured. Am. *24;* Clements, Crypt. Form. Colo. *145, 147, 580;* Ellis N. Am. Fungi *1452;* Ellis & Ev. Fungi Columb. *262, 351, 352, 755, 764, 1464, 1648, 1959;* Ellis & Ev. N. Am. Fungi *2252b;* Garrett, Fungi Utah. *20, 46, 70, 85, 115, 133, 157, 171, 236;* D. Griff. W. Am. Fungi *238, 238a;* Kellerm. Ohio Fungi *73, 74;* Seym. & Earle, Econ. Fungi *324a, b, c, 516;* Shear, N. Y. Fungi *320;* Syd. Ured. *1268, 1914, 1915, 1945, 2043, 2332*.

66. **Bullaria (?) Pinaropappi** (Sydow) Arthur & Mains.

Puccinia Pinaropappi Sydow, Hedwigia Beibl. **40**: 127. 1901.

O. Pycnia unknown.

II. Uredinia amphigenous, scattered or in small groups 2–3 mm. across, oval or oblong, 0.1–0.6 mm. long, early naked, pulverulent, cinnamon-brown, ruptured epidermis evident; urediniospores broadly ellipsoid or globoid, 18–21 by 21–27 μ; wall cinnamon-brown, thick, 3 μ, sometimes thickened up to 4.5 μ at base, finely and closely echinulate, the pores 2, equatorial.

III. Telia amphigenous, or caulicolous, scattered, oval or oblong, 0.3–0.6 mm. in length, early naked, compact becoming slightly pulverulent, blackish and shining, ruptured epidermis evident; teliospores broadly ellipsoid, 23–26 by 29–35 μ, rounded above and below, not constricted at septum; wall dark chestnut- or chocolate-brown, uniform in thickness, 3 μ, rather closely, finely, and inconspicuously verrucose, appearing smooth, the pore of the upper cell somewhat variable, usually in the lower half of the cell, often at septum, the pore of the lower cell usually in the upper half of the cell; pedicel colorless, 10 μ wide, up to 40 μ long, fragile, sometimes laterally attached.

ON CICHORIACEAE:
Pinaropappus roseus Less., Texas.
TYPE LOCALITY: Austin, Texas, on *Pinaropappus roseus*.
DISTRIBUTION: Known only from the type locality.
EXSICCATI: Barth. Fungi Columb. *2460*.

36. *TELEUTOSPORA Arth. & Bisby; Arth. Bull. Torrey Club 48: 38. 1921.

Telospora Arth. Résult. Sci. Congr. Bot. Vienne 346, in part. 1906.
Haplotelium Sydow, Ann. Myc. 20: 124. 1922.

Cycle of development includes pycnia (sometimes obsolete) and telia, both subepidermal.

Pycnia immersed in the tissues of the host, globoid or flask-shaped, with protruding ostiolar filaments.

Telia erumpent, definite, on a limited or definite mycelium. Teliospores free, pedicelled, one-celled, sometimes germinating in the sorus at maturity; wall colored, smooth or verrucose, with one apical pore.

Type species, *Uromyces Rudbeckiae* (on *Rudbeckia laciniata*).

Inhabiting monocotyledonous hosts.	
Host belonging to family Liliaceae.	1. *T. heteroderma.*
Inhabiting dicotyledonous hosts.	
Host belonging to family Caesalpiniaceae.	
Teliospore-wall less than 3 μ thick.	2. *T. jamaicensis.*
Teliospore-wall 3 μ thick, or more.	3. *T. bauhiniicola.*
Host belonging to family Fabaceae.	4. *T. abbreviata.*
Host belonging to family Euphorbiaceae.	5. *T. Tranzschelii.*
Host belonging to family Myrsinaceae.	6. *T. Myrsines.*
Host belonging to family Primulaceae.	7. *T. nevadensis.*
Host belonging to family Carduaceae.	
Teliospore-wall chestnut-brown, 2–3 μ thick.	8. *T. Solidaginis.*
Teliospore-wall cinnamon-brown, 1.5–2.5 μ thick.	9. *T. amoena.*
Teliospore-wall pale-brownish, 1 μ thick.	
Teliospores less than 30 μ long.	10. *T. Rudbeckiae.*
Teliospores more than 30 μ long.	11. *T. Bidentis.*

1. Teleutospora heteroderma (Sydow) Arthur & Bisby.

Uromyces heterodermus Sydow, Ann. Myc. 4: 29. 1906.

O. Pycnia amphigenous, not uncommon, gregarious in loose groups with the telia, 0.5–1.5 mm. across, inconspicuous, dark golden-brown, flattened-globoid, 100–185 μ broad, 65–130 μ high; ostiolar filaments few, loose, up to 65 μ long.

III. Telia amphigenous, numerous, scattered or in small groups, sometimes upon pale spots, roundish or oval, 0.3–2 mm. across, rather early naked, pulverulent, dark cinnamon-brown, surrounding epidermis noticeable; teliospores ellipsoid or broadly ellipsoid, 19–26 by 26–43 μ, rounded above, rounded or slightly narrowed below; wall dark golden-brown, 1.5 μ thick, thicker at apex with a distinct hyaline papilla, 3–6 μ, coarsely verrucose above, with the markings often in longitudinal ridges, smoother below; pedicel hyaline, fragile, short.

ON LILIACEAE:
Erythronium grandiflorum Pursh, Montana, Utah, Washington; British Columbia.
Erythronium montanum S. Wats., Washington.
Erythronium obtusatum Goodding, Wyoming.
Erythronium parviflorum (S. Wats.) Goodding (*E. grandiflorum parviflorum* S. Wats.), Colorado, Montana, Oregon, Utah, Wyoming.

TYPE LOCALITY: Wasatch Mountains, Utah, on *Erythronium parviflorum*.

DISTRIBUTION: Rocky Mountain region from Colorado and Utah northward, and to the coast in Oregon.

EXSICCATI: Barth. Fungi Columb. *4694;* Barth. N. Am. Ured. *789, 1592, 1692;* Ellis & Ev. Fungi Columb. *750;* Garrett, Fungi Utah. *118*.

2. Teleutospora jamaicensis (Vesterg.) Arthur & Bisby.

Uromyces jamaicensis Vesterg. Ark. Bot. 4^{15}: 33. 1905.

O. Pycnia chiefly epiphyllous, gregarious in small groups with the telia, brownish, flattened-globoid, 65–100 μ broad, 45–70 μ high; ostiolar filaments compact, hardly extending beyond the ostiole.

III. Telia amphigenous, numerous, gregarious in small groups or occurring singly, sometimes on small yellowish spots, roundish, small, 0.1–1 mm. across, early naked, pulverulent, chestnut-brown, surrounding epidermis noticeable; teliospores globoid, broadly ellipsoid or obovoid, 12–17 by 16–23 μ, rounded or slightly narrowed at both ends; wall cinnamon-brown, 1.5–2 μ, sometimes up to 3 μ, thick, thicker at apex, up to 4 μ, with a lighter crater or cap-

**Teleutospora* in collaboration with GUY RICHARD BISBY.

shaped crown, closely and finely reticulate, appearing verrucose under the lower powers of the microscope; pedicel pale, fragile, 4–15 μ long.

ON CAESALPINIACEAE:
Bauhinia divaricata L., Guanajuato; Cuba.
Bauhinia Pauletia Pers., Porto Rico.
Bauhinia sp., Jamaica.
TYPE LOCALITY: Constant Spring, Jamaica, on *Bauhinia* sp.
DISTRIBUTION: South-central Mexico and the West Indies; also in South America.
ILLUSTRATION: Ark. Bot. **4**[15]: *pl. 2, f. 14.*

3. **Teleutospora bauhiniicola** (Arth.) Arth. & Bisby; Arth. Bull. Torrey Club **48**: 39. 1921.

Uromyces bauhiniicola Arth. Bot. Gaz. **39**: 389. 1905.
Telospora bauhiniicola Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.

O. Pycnia epiphyllous, few, gregarious in small groups, usually opposite the telia, punctiform, brownish, depressed-globoid, 60–130 μ in diameter, 30–65 μ high; ostiolar filaments compact, short.

III. Telia at first hypophyllous, becoming also somewhat epiphyllous, numerous, scattered or in small groups, roundish, small, 0.2–1 mm. across, early naked, pulverulent, chocolate-brown, surrounding epidermis inconspicuous; teliospores globoid or broadly ellipsoid, 14–21 by 18–26 μ, rounded at both ends; wall cinnamon- or chestnut-brown, thick, 3–4 μ, thicker at apex, 4–7 μ, with a broad lighter-colored umbo, finely reticulate; pedicel pale or colorless, often roughened below, rather fragile, but often two or three times as long as the spore.

ON CAESALPINIACEAE:
Bauhinia Pringlei S. Wats., Jalisco.
Bauhinia sp., Guerrero.
TYPE LOCALITY: Guadalajara, Mexico, on *Bauhinia Pringlei.*
DISTRIBUTION: South-west central Mexico.
ILLUSTRATION: Ark. Bot. **4**[15]: *pl. 1, f. 9.*
EXSICCATI: Barth. N. Am. Ured. *286.*

4. **Teleutospora abbreviata** (Arth.) Arthur & Bisby.

Uromyces abbreviatus Arth. Bull. Torrey Club **42**: 587. 1915.

O. Pycnia hypophyllous, scattered among the telia, inconspicuous, deep-seated, dark honey-yellow, globose or flattened-globose, 115–200 μ in diameter, 95–140 μ high; ostiolar filaments dense, often falling away, up to 60 μ in length.

III. Telia hypophyllous, rarely also epiphyllous, scattered over large areas, often densely clustered, roundish, 0.2–0.7 mm. across, early naked, pulverulent, chocolate-brown, surrounding epidermis at first evident, later often hidden by the loose spores; teliospores ellipsoid or irregularly obovoid, 21–26 by 27–40 μ (sometimes variable in size, and larger), rounded above, rounded or narrowed below; wall chestnut-brown, 2–3 μ thick, 3–5 μ thick at apex, with a slight umbo over the pore, smooth; pedicel colorless, delicate, fugacious, half as long as spore or less.

This species is correlated with *Pucciniola Psoraleae* (Peck) Arth., the telia being morphologically indistinguishable from those of that species. The two forms when more fully studied might possibly be united under one name.

ON FABACEAE:
Hoita physodes (Dougl.) Rydb. (*Psoralea physodes* Dougl.), California, Washington; British Columbia.
Psoralidium Purshii (Vail) Rydb. (*Psoralea Purshii* Vail), Nevada.
TYPE LOCALITY: Winnemucca, Nevada, on *Psoralea Purshii.*
DISTRIBUTION: British Columbia to northern Nevada and central California.
EXSICCATI: Barth. Fungi Columb. *4884;* Barth. N. Am. Ured. *1582;* D. Griff. W. Am. Fungi *390.*

5. **Teleutospora Tranzschelii** (Sydow) Arthur & Bisby.

Uromyces Tranzschelii Sydow; Tranz. Ann. Myc. 8: 20. 1910.

O. Pycnia hypophyllous, scattered among the telia, or in groups, noticeable, dark-yellow, globoid or flask-shaped, 100–145 μ broad by 75–130 μ high; ostiolar filaments dense, agglutinate into a truncate column, 50–80 μ in height, 50–70 μ in diameter at the ostiole.

III. Telia hypophyllous, occasionally sparingly epiphyllous, numerous, evenly scattered over large areas, or sometimes in groups around the pycnia, roundish, 0.2–0.6 mm. across, early naked by a central pore, pulverulent, chestnut-brown, surrounding epidermis crateriform, conspicuous; teliospores globoid or ellipsoid, 15–22 by 19–30 μ, rounded at both ends; wall cinnamon-brown, 1–2 μ thick, with a low, subhyaline umbo over the apical pore, finely verrucose, the markings often in irregular-longitudinal lines; pedicel colorless, deciduous.

This species is correlated with *Pucciniola coördinata* Arth., a long-cycled, autoecious species, but without uredinia, and with *Nigredo occidentalis* (Dietel) Arth., a long-cycled, heteroecious species. The morphological characters of corresponding stages in the three species are nearly or quite identical, and together with the correspondence in hosts doubtless indicate a common origin.

ON EUPHORBIACEAE:

Chamaesyce serpens (H.B.K.) Small (*Euphorbia serpens* H.B.K.), California.
Tithymalus chamaesula (Boiss.) Wooton & Standley (*Euphorbia chamaesula* Boiss.), New Mexico.
Tithymalus montanus (Engelm.) Small (*Euphorbia montana* Engelm.), Colorado, Utah, Wyoming.
Tithymalus Palmeri (Engelm.) Arth. (*Euphorbia Palmeri* Engelm.), California; Lower California.
Tithymalus robustus (Engelm.) Small (*Euphorbia montana robusta* Engelm.), Arizona, Colorado, Montana, Utah, Wyoming.

TYPE LOCALITY: Colorado, on *Euphorbia montana*.
DISTRIBUTION: From Wyoming to New Mexico, southern California, and Lower California.
EXSICCATI: Barth. N. Am. Ured. *499, 1899, 2500;* Ellis & Ev. Fungi Columb. *1069;* Ellis & Ev. N. Am. Fungi *2230;* Garrett, Fungi Utah. *97*.

6. **Teleutospora Myrsines** (Dietel) Arthur & Bisby.

Uromyces Myrsines Dietel, Hedwigia **36**: 26. 1897.
Uromyces Usterianus Dietel, Ann. Myc. **6**: 96. My 1908.
Uromyces Rhapaneae P. Henn. Hedwigia **48**: 1. S 1908.
Haplotelium Myrsines Sydow, Ann. Myc. **20**: 124. 1922.

O. Pycnia unknown.

III. Telia hypophyllous, crowded upon reddish or blackish spots 2–5 mm. in diameter, round, 0.1–0.2 mm. in diameter, often confluent, early naked, pulvinate, light chocolate-brown, ruptured epidermis inconspicuous; teliospores oblong or oblong-ellipsoid, 13–16 by 27–39 μ, rounded or acute above, narrowed below; wall pale golden-brown, rather thin, 1–2 μ, thickened at apex, 4–8 μ, smooth; pedicel colorless, short.

ON MYRSINACEAE:

Ardisia compressa H.B.K., Costa Rica.

TYPE LOCALITY: Rio de Janeiro, Brazil, on *Myrsine* sp.
DISTRIBUTION: Costa Rica; also in South America.

7. **Teleutospora nevadensis** (Hark.) Arthur & Bisby.

Uromyces nevadensis Hark. Bull. Calif. Acad. **1**: 36. 1884.
Caeomurus nevadensis Kuntze, Rev. Gen. **3**^{3}: 450. 1898.

O. Pycnia unknown.

III. Telia amphigenous, circinating in groups 2–5 mm. across or somewhat scattered, round or oval, 0.2–1 mm. across, early naked, pulvinate, becoming somewhat pulverulent, chestnut-brown, ruptured epidermis conspicuous; teliospores oblong, oblong-obovoid, or ellipsoid, 19–27 by 29–47 μ, rounded at apex, rounded or narrowed toward base; wall cinnamon-brown, lighter or colorless at apex, moderately thick, 1.5–2.5 μ, thickened at apex, 5–7 μ, moderately and rather finely verrucose; pedicel colorless, fragile.

ON PRIMULACEAE:

Primula suffrutescens A. Gray, California, Nevada.

TYPE LOCALITY: Lake Tahoe, Nevada, on *Primula suffrutescens*.
DISTRIBUTION: Mountainous region of central California, and adjacent Nevada.

8. **Teleutospora Solidaginis** (Sommerf.) Arth. & Bisby; Arth. Bull. Torrey Club **48**: 39. 1921.

Caeoma Solidaginis Sommerf. Suppl. Fl. Lapp. 234. 1826.
Uromyces Solidaginis Niessl, Verh. Nat.-Ver. Brünn **10**: 163. 1872.
Caeomurus Solidaginis Kuntze, Rev. Gen. **3**^{3}: 450. 1898.
Telospora Solidaginis Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.
Haplotelium Solidaginis Sydow, Ann. Myc. **20**: 124. 1922.

O. Pycnia not found; probably wanting.

III. Telia hypophyllous, sometimes also petiolicolous or caulicolous, crowded and often confluent in orbicular groups upon the leaves, or elongate groups upon the petioles or stems, 2–10 mm. across, upon yellowish spots, roundish, small, 0.3–0.7 mm. across, early naked, compact, pulvinate, chocolate-brown, surrounding epidermis noticeable; teliospores obovate or ellipsoid, 17–25 by 24–33 μ, narrowed or rounded at both ends; wall chestnut-brown, 2–3 μ thick, much thicker at apex, 6–12 μ, smooth; pedicel nearly colorless, about as long as spore.

ON CARDUACEAE:

Solidago elongata Nutt., Wyoming.
Solidago pulcherrima A. Nelson (*S. nemoralis* Auct.), Colorado.
Solidago serotina Ait., Idaho, Montana, Washington, Wyoming.
Solidago sp., Oregon.

TYPE LOCALITY: Norrland, Sweden, on *Solidago virgaurea*.

DISTRIBUTION: Colorado and Montana westward to Oregon and Washington; also in Europe and Asia.

ILLUSTRATIONS: Arch. Nat. Land. Böhmen **13**: *f. 12;* Beitr. Krypt. Schweiz 2^2: *f. 44;* Sitz.-ber. Boehm. Ges. Wiss. 1902^{46}: *f. 19–24.*

EXSICCATI: Ellis & Ev. N. Am. Fungi *2883;* D. Griff. W. Am. Fungi *361.*

9. **Teleutospora amoena** (Sydow) Arthur & Bisby.

Uromyces amoenus Sydow, Ann. Myc. **4**: 28. 1906.

O. Pycnia unknown.

III. Telia hypophyllous, densely grouped and often confluent on circular, purplish spots 2–8 mm. across, the margin of the spots yellow, roundish, small, 0.2–0.7 mm. across, early naked, compact, pulvinate, dark chestnut-brown, covered by the tomentose pubescence of the host, ruptured epidermis inconspicuous; teliospores globoid, obovoid, or ellipsoid, 16–23 by 22–30 μ, usually rounded above and narrowed below; wall dark golden- or cinnamon-brown, moderately thick, 1.5–2.5 μ, thicker at apex, 4–7 μ, smooth; pedicel pale-yellowish, up to the length of spore.

ON CARDUACEAE:

Anaphalis margaritacea occidentalis Greene, Oregon.
Anaphalis subalpina (A. Gray) Rydb. (*A. margaritacea subalpina* A. Gray), Idaho, Oregon, Washington, Wyoming; British Columbia.

TYPE LOCALITY: Washington, on *Gnaphalium* (*Anaphalis*) *margaritacea.*

DISTRIBUTION: Wyoming to British Columbia and Oregon.

EXSICCATI: Barth. N. Am. Ured. *1385, 1584;* Ellis & Ev. Fungi Columb. *1795.*

10. **Teleutospora Rudbeckiae** (Arth. & Holway) Arth. & Bisby; Arth. Bull. Torrey Club **48**: 39. 1921.

Uromyces Rudbeckiae Arth. & Holway; Arth. Bull. Iowa Agr. Coll. **1884**: 154. 1885.
Caeomurus Rudbeckiae Kuntze, Rev. Gen. 3^3: 450. 1898.
Telospora Rudbeckiae Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.

O. Pycnia unknown.

III. Telia hypophyllous, occasionally also epiphyllous, densely gregarious upon brownish spots, paler below, 1–10 mm. across, rather circinate, small, 0.2–0.8 mm. in diameter, early naked, compact, pulvinate, cinnamon-brown, soon cinereous from germination, surrounding epidermis not noticeable; teliospores ellipsoid, obovoid, or pyriform, 11–17 by 19–30 μ, rounded, acute or obtuse above, narrowed below; wall yellowish or very pale chestnut-brown, thin, 1 μ, thicker at apex, 5–7 μ, smooth; pedicel hyaline, twice as long as spore or less.

ON CARDUACEAE:

Rudbeckia laciniata L., Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Montana, Nebraska, New Mexico, North Dakota, Pennsylvania, Wisconsin, Wyoming; Ontario.
Rudbeckia sp., Texas.

TYPE LOCALITY: Decorah, Iowa, on *Rudbeckia laciniata.*

DISTRIBUTION: Ontario and Pennsylvania to Montana and southeastern Texas.

ILLUSTRATION: Bull. Lab. Nat. Hist. Univ. Iowa 3^2: *pl. 1, f. 1.*

EXSICCATI: Arth. & Holway, Ured. Exs. Ic. *1;* Barth. Fungi Columb. *4394;* Barth. N. Am. Ured. *299, 1099, 1397;* Brenckle, Fungi Dak. *274;* Ellis & Ev. Fungi Columb. *2097;* Ellis, N. Am. Fungi *1439;* Rab.-Wint. Fungi Eur. *3412;* Sydow, Ured. *1305, 1962.*

11. **Teleutospora Bidentis** (Lagerh.) Arthur & Bisby.

Uromyces Bidentis Lagerh. Bull. Soc. Myc. Fr. **11**: 213. 1895.
Caeomurus Bidentis Kuntze, Rev. Gen. **3**[3]: 449. 1898.
Uromyces densus Arth. Mycologia **7**: 196. 1915.

O. Pycnia unknown.

III. Telia hypophyllous, numerous, in small circinating groups on roundish, discolored spots 1–4 mm. across, sometimes confluent, roundish or oval, 0.1–1 mm. across, the central sorus largest, surrounded by the smaller ones, early naked, compact, pulvinate, dull cinnamon-brown, becoming waxy-cinereous from germination, surrounding epidermis inconspicuous; teliospores obovoid or oblong, 15–23 by 30–45 μ, rounded or narrowed above, narrowed below; wall pale cinnamon-brown, thin, 1 μ, thicker above, 4–9 μ, smooth; pedicel hyaline, once or twice length of spore.

This species is correlated with *Klebahnia Bidentis* (P. Henn.) Arth., the pycnia and telia being morphologically indistinguishable from that species. Sometimes the two forms occur intermixed upon the same leaf, and seemingly arise from the same mycelium. When more fully studied it may be found advisable to unite them under one name.

ON CARDUACEAE:

Bidens leucantha (L.) Willd., Porto Rico.
Bidens pilosa L., Haïti; Porto Rico.
Bidens squarrosa H.B.K. (*B. antiguensis* Coult., *B. tereticaulis* DC.), Costa Rica.

TYPE LOCALITY: Ecuador, on *Bidens andicola*.
DISTRIBUTION: West Indies and Central America; also in South America.

37. *MICROPUCCINIA Rostr. Plantep. Haandb. 266. 1902.

Puccinia Link, Ges. Nat. Freunde Berlin Mag. **7**: 29. 1815. Not *Puccinia* Willd. 1787, nor *Puccinia* Pers. 1794.
Caeoma § *Dicaeoma* Nees, Syst. Pilze 16. 1816.
Leptopuccinia Rostr. Plantep. Haandb. 268. 1902.
Dasyspora Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906. Not *Dasyspora* Berk. & Curt. 1853.
Polioma Arth. Jour. Myc. **13**: 29. 1907.
Sclerotelium Sydow, Ann. Myc. **19**: 172. 1921.
Coronotelium Sydow, Ann. Myc. **19**: 172. 1921.
Trailia Sydow, Ann. Myc. **20**: 121. 1922.

Cycle of development includes pycnia (frequently obsolete) and telia, both subepidermal or the pycnia rarely subcuticular.

Pycnia submerged in the tissues of the host beneath the epidermis, globoid or flask-shaped, with protruding ostiolar filaments (or when subcuticular, superficial and conic, without ostiolar filaments).

Telia erumpent, or occasionally long covered by the epidermis, definite, often in circinating groups, compact, sometimes confluent into a cumulative mass, frequently cinereous by germination of the spores at their maturity, especially when unaccompanied by pycnia, or pulverulent. Teliospores free, pedicelled, two-celled, in some species also few or many one-celled (mesospores); wall colored, in a few species nearly or quite colorless, firm, smooth or less often verrucose, with one pore in each cell, usually in the upper part.

Type species, *Micropuccinia Ribis* (DC.) Rostr. on *Ribes rubrum*.

Host belonging to family Liliaceae.
  Teliospore-wall conspicuously and irregularly tuberculate. 1. *M. tumamocensis*.
  Teliospore-wall finely and inconspicuously striate. 2. *M. Moreniana*.
Host belonging to family Convallariaceae. 3. *M. mesomajalis*.
Host belonging to family Aristolochiaceae. 4. *M. asarina*.
Host belonging to family Polygonaceae. 5. *M. ornata*.
Host belonging to family Chenopodiaceae. 6. *M. Eurotiae*.
Host belonging to family Portulacaceae. 7. *M. agnita*.
Host belonging to family Caryophyllaceae.
  Teliospore-wall nearly or quite uniformly thin. 8. *M. detonsa*.
  Teliospore-wall much thickened above.
    Telia round or oval. 9. *M. Arenariae*.
    Telia long and linear. 10. *M. hysteriiformis*.
Host belonging to family Ranunculaceae.
  Telia long covered by epidermis. 11. *M. Pulsatillae*.
  Telia soon naked.
    Teliospores clavate or fusiform, smooth.
      Teliospores narrow, 12–16 μ. 12. *M. Anemones-virginianae*.
      Teliospores broad, 20–26 μ. 13. *M. gemella*.

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Teliospores ellipsoid.
Teliospore-wall minutely verrucose, seemingly smooth.
Teliospore-wall with umbo at apex. 14. *M. Treleasiana.*
Teliospore-wall uniformly thin.
Teliospores small, up to 32 μ long; mesospores absent. 15. *M. Delphinii.*
Teliospores larger, up to 35 μ long; mesospores present. 16. *M. andina.*
Teliospore-wall coarsely verrucose. 17. *M. Ranunculi.*
Host belonging to family Berberidaceae. 18. *M. Berberidis-trifoliae.*
Host belonging to family Fumariaceae. 19. *M. Brandegei.*
Host belonging to family Brassicaceae.
Telia tardily naked, finally becoming pulverulent.
Teliospores narrowly oblong. 20. *M. Dentariae.*
Teliospores ellipsoid.
Teliospores with apical umbo. 21. *M. Drabae.*
Teliospores with inconspicuous or no umbo. 22. *M. utahensis.*
Telia early naked, pulvinate.
Teliospores oblong, the pedicels persistent.
Teliospore-wall thin, 1–1.5 μ. 23. *M. Thlaspeos.*
Teliospore-wall thicker, 1.5–2 μ. 24. *M. Holboellii.*
Teliospores usually ellipsoid, the pedicels deciduous.
Teliospore-wall thin, 1–2 μ. 25. *M. Cruciferarum.*
Teliospore-wall thicker, 2–3.5 μ. 26. *M. aberrans.*
Host belonging to family Crassulaceae.
Teliospore-wall finely verrucose. 27. *M. Rydbergii.*
Teliospore-wall nearly or quite smooth. 28. *M. Rhodiolae.*
Host belonging to family Saxifragaceae.
Teliospore-wall smooth; teliospores oblong-fusiform.
Teliospores large, 18–20 × 40–50 μ. 29. *M. laurentiana.*
Teliospores smaller, 13–16 × 26–38 μ. 30. *M. pallido-maculata.*
Teliospore-wall smooth with occasional striae; teliospores mostly oblong. 31. *M. Heucherae.*
Teliospore-wall striate; teliospores mostly ellipsoid.
Teliospore-wall finely striate. 32. *M. curtipes.*
Teliospore-wall coarsely striate. 33. *M. Lithophragmae.*
Teliospore-wall verrucose; teliospores mostly ellipsoid or oblong.
Teliospore-wall coarsely verrucose.
Teliospore-wall thickened up to 5 μ above. 34. *M. Heterisiae.*
Teliospore-wall thickened up to 7 μ above. 35. *M. turrita.*
Teliospore-wall minutely verrucose, appearing smooth.
Teliospores 19–23 μ broad. 36. *M. Saxifragae-tricuspidatae.*
Teliospores 15–18 μ broad. 37. *M. Jueliana.*
Host belonging to family Parnassiaceae. 38. *M. Parnassiae.*
Host belonging to family Grossulariaceae.
Teliospores verrucose. 39. *M. Ribis.*
Teliospores smooth. 40. *M. Parkerae.*
Host belonging to family Rosaceae.
Teliospores ellipsoid; teliospore-wall rugose. 41. *M. Sieversiae.*
Teliospores cylindric; teliospore-wall smooth. 42. *M. Waldsteiniae.*
Host belonging to family Geraniaceae. 43. *M. Leveillei.*
Host belonging to family Polygalaceae. 44. *M. Pyrolae.*
Host belonging to family Sapindaceae. 45. *M. Arechavaletae.*
Host belonging to family Rhamnaceae. 46. *M. Mesnieriana.*
Host belonging to family Tiliaceae. 47. *M. Triumfettae.*
Host belonging to family Malvaceae.
Teliospores large, 38–75 μ.
Telia usually light-brown, scattered. 48. *M. Malvacearum.*
Telia usually dark-brown, gregarious.
Teliospores up to 75 μ long; wall moderately thick, 1.5–4 μ. 49. *M. Sherardiana.*
Teliospores up to 48 μ long; wall very thick, 3–5 μ. 50. *M. Sidalceae.*
Teliospores small, 18–45 μ.
Telia usually dark-brown.
Mesospores predominating. 51. *M. heterospora.*
Mesospores rare or wanting. 52. *M. lobata.*
Telia usually light-brown.
Teliospore-wall thick, 2–3 μ, much thicker above. 53. *M. Anodae.*
Teliospore-wall thin, 1–2 μ, scarcely thicker above. 54. *M. exilis.*
Host belonging to family Sterculiaceae. 55. *M. filopes.*
Host belonging to family Dilleniaceae. 56. *M. hiascens.*
Host belonging to family Violaceae. 57. *M. Fergussoni.*
Teliospore-wall smooth.
Teliospore-wall striate.
Teliospores ellipsoid or oblong, striae few. 58. *M. ornatula.*
Teliospores narrowly oblong, striae numerous. 59. *M. canadensis.*
Host belonging to family Lythraceae. 60. *M. Cupheae.*
Host belonging to family Onagraceae.

Teliospore-wall smooth.
Teliospores oblong.
Teliospores small, 24–39 μ long. 61. *M. Circaeae.*
Teliospores large, 34–45 μ long. 62. *M. Fuchsiae.*
Teliospores cylindric, 32–58 μ long. 63. *M. gigantea.*
Teliospore-wall minutely verrucose.
Teliospores moderately large, 30–42 μ long. 64. *M. Epilobii.*
Teliospores smaller, 27–38 μ long. 65. *M. scandica.*
Host belonging to family Araliaceae. 66. *M. Araliae.*
Host belonging to family Ammiaceae.
Teliospores oblong; telia tardily naked. 67. *M. Cryptotaeniae.*
Teliospores ellipsoid.
Teliospores verrucose; telia tardily naked. 68. *M. Musenii.*
Teliospores smooth; telia early naked.
Teliospore-pores with prominent umbo. 69. *M. poromera.*
Teliospore-pores with small umbo or none. 70. *M. Ligustici.*
Host belonging to family Cornaceae. 71. *M. porphyrogenita.*
Host belonging to family Primulaceae. 72. *M. Dayi.*
Host belonging to family Santalaceae. 73. *M. Comandrae.*
Host belonging to family Gentianaceae. 74. *M. Haleniae.*
Host belonging to family Asclepiadaceae.
Teliospores oblong. 75. *M. concrescens.*
Teliospores globoid or broadly obovate. 76. *M. obliqua.*
Host belonging to family Dichondraceae. 77. *M. Dichondrae.*
Host belonging to family Polemoniaceae.
Teliospores oblong or cylindric, up to 42 μ long. 78. *M. Polemonii.*
Teliospores ellipsoid or oblong, up to 35 μ long. 79. *M. gulosa.*
ost belonging to family Hydrophyllaceae.
Teliospore-wall roughened.
Teliospore-wall finely verrucose. 80. *M. Hydrophylli.*
Teliospore-wall sparsely tuberculate. 81. *M. Romanzoffiae.*
Teliospore-wall smooth.
Teliospores clavate, truncate above. 82. *M. Phaceliae.*
Teliospores obovate, obtuse above. 83. *M. Heliotropii.*
Host belonging to family Boraginaceae. 84. *M. Mertensiae.*
Host belonging to family Verbenaceae.
Pedicel moderately inflated.
Mesospores none or rare. 85. *M. Urbaniana.*
Mesospores usually predominant. 86. *M. Lantanae.*
Pedicel greatly inflated. 87. *M. permagna.*
Host belonging to family Lamiaceae.
Teliospore-wall colored.
Teliospores verrucose.
Teliospore-wall uniformly thick. 88. *M. distorta.*
Teliospore-wall thicker above in some spores. 89. *M. Physostegiae.*
Teliospores smooth.
Teliospores rounded at ends; teliospore-wall with small umbo over pore. 90. *M. Schneideri.*
Teliospores narrowed at ends; teliospore-wall much thicker above. 91. *M. Hyssopi.*
Teliospore-wall colorless or nearly so.
Teliospore-wall considerably thickened above, 2–5 μ. 92. *M. pallidissima.*
Teliospore-wall not or slightly thickened above.
Teliospores oblong, 27–48 μ long. 93. *M. delicatula.*
Teliospores cylindric, 48–61 μ long. 94. *M. nivea.*
Host belonging to family Solanaceae. 95. *M. Physalidis.*
Telia in compact, localized groups.
Teliospores clavate, lower cell longer than upper. 96. *M. solanitum.*
Teliospores ellipsoid, rarely clavate, cells equal.
Teliospores averaging more than 32 μ long. 97. *M. Sarachae.*
Teliospores averaging less than 32 μ long.
Teliospores 23–28 μ long. 98. *M. incondita.*
Teliospores 26–34 μ long. 99. *M. Pittieriana.*
Host belonging to family Scrophulariaceae.
Teliospores finely verrucose.
Teliospore-wall uniformly thick. 100. *M. acrophila.*
Teliospore-wall thicker above.
Teliospore-wall striately verrucose. 101. *M. Clintonii.*
Teliospore-wall evenly verrucose. 102. *M. rhaetica.*
Teliospores smooth or apparently so.
Teliospore-wall uniformly thick. 103. *M. Chelonis.*
Teliospore-wall thicker above.
Teliospore-wall 1.5 μ or more thick at sides.
Teliospores broad, 18–23 μ. 104. *M. Pentstemonis.*
Teliospores narrow, 14–20 μ.
Teliospore-wall dark cinnamon-brown. 105. *M. Seymeriae.*
Teliospore-wall golden- or light cinnamon-brown.
Teliospores rounded above. 106. *M. nesodes.*
Teliospores obtuse above. 107. *M. Veronicarum.*

Teliospore-wall less than 1.5 μ thick at sides.
Teliospores not or slightly constricted at septum. 108. *M. albulescens.*
Teliospores strongly constricted at septum. 109. *M. Wulfeniae.*
Host belonging to family Bignoniaceae. 110. *M. depallens.*
Host belonging to family Acanthaceae. 111. *M. Elytrariae.*
Host belonging to family Rubiaceae.
Teliospores clavate. 112. *M. rubefaciens.*
Teliospores ellipsoid or obovate. 113. *M. lateritia.*
Host belonging to family Caprifoliaceae.
Teliospores rough. 114. *M. Linkii.*
Teliospores smooth.
Teliospore-wall dark cinnamon-brown. 115. *M. Symphoricarpi.*
Teliospore-wall golden-brown. 116. *M. Apocyni.*
Host belonging to family Adoxaceae. 117. *M. Adoxae.*
Host belonging to family Campanulaceae. 118. *M. Campanulae.*
Host belonging to family Lobeliaceae. 119. *M. Lobeliae.*
Host belonging to family Ambrosiaceae. 120. *M. Xanthii.*
Host belonging to family Carduaceae.
Of the tribe Vernonieae.
Teliospores finely verrucose.
Teliospores not or slightly constricted. 121. *M. rotundata.*
Teliospores strongly constricted. 122. *M. discreta.*
Teliospores smooth. 123. *M. paupercula.*
Of the tribe Eupatorieae.
Teliospore-wall thickened above.
Pedicel fragile, colorless. 124. *M. tolimensis.*
Pedicel persistent, concolorous. 125. *M. praemorsa.*
Teliospore-wall uniform, very thin. 126. *M. Spegazzinii.*
Of the tribe Astereae.
Telia long covered by epidermis; stroma present. 127. *M. Virgaureae.*
Telia early naked; stroma wanting.
Teliospores usually narrowed below; pedicel short. 128. *M. Asteris.*
Teliospores usually rounded below; pedicel long.
Teliospores ellipsoid or obovate. 129. *M. Grindeliae.*
Teliospores cylindric or fusiform. 130. *M. Marianae.*
Of the tribe Heliantheae.
Teliospore-wall roughened.
Teliospore-wall uniformly thin, 1–2 μ.
Wall coarsely verrucose. 131. *M. Notopterae.*
Wall finely verrucose-rugose. 132. *M. ferox.*
Teliospore-wall thick, 2–2.5 μ, thicker above. 133. *M. absicca.*
Teliospore-wall smooth.
Teliospores averaging more than 50 μ long.
Teliospores oblong, 45–70 μ long.
Teliospore-wall thin above, 3–4 μ. 134. *M. Rudbeckiae.*
Teliospore-wall thick above, 6–12 μ 135. *M. ordinata.*
Teliospores clavate, 48–58 μ long. 136. *M. semota.*
Teliospores averaging less than 50 μ long.
Teliospores 10–16 μ broad; in temperate regions. 137. *M. Silphii.*
Teliospores 14–22 μ broad; in sub-tropical regions. 138. *M. Melampodii.*
Of the tribe Helenieae.
Teliospores usually narrowed below; wall cinnamon-brown, pedicel short. 139. *M. Flaveriae.*
Teliospores usually rounded below; wall chestnut-brown, pedicel long. 129. *M. Grindeliae.*
Of the tribe Anthemideae. 140. *M. Millefolii.*
Of the tribe Senecioneae.
Teliospores ellipsoid; pedicel deciduous.
Teliospores narrow, 14–18 μ; wall thin, 1 μ. 141. *M. conglomerata.*
Teliospores broad, 18–26 μ; wall thicker 1.5–2.5 μ. 142. *M. expansa.*
Teliospores obovate, oblong or clavate; pedicel persistent.
Telia brown, becoming cinereous by germination.
Teliospores very pale cinnamon-brown or colorless. 143. *M. Schistocarphae.*
Teliospores cinnamon- or chestnut-brown.
In sub-tropical regions. 144. *M. Emiliae.*
In temperate regions. 145. *M. recedens.*
Telia blackish. 129. *M. Grindeliae.*
Host belonging to family Cichoriaceae.
Teliospores verrucose. 146. *M. Suksdorfii.*
Teliospores smooth.
Sori evenly distributed over leaf-surface. 147. *M. Fraseri.*
Sori in groups.
Sori chocolate-brown or blackish.
Teliospores narrowed at both ends. 148. *M. columbiensis.*
Teliospores obtuse or rounded at both ends. 129. *M. Grindeliae.*
Sori cinnamon-brown, becoming cinereous. 149. *M. maculosa.*

1. **Micropuccinia tumamocensis** (Arth.) Arthur & Jackson.

Puccinia tumamocensis Arth. Bull. Torrey Club **42**: 589. 1915.

O. Pycnia hypophyllous, in small groups, surrounded by the telia, honey-yellow, globose, 130–190 μ in diameter, deep-seated; ostiolar filaments short, 30–40 μ long.

III. Telia hypophyllous, closely associated in elliptic groups 3–10 mm. long, surrounding the pycnia, often confluent, elliptic, 1–2 mm. long, becoming naked by the rupture of the epidermis which remains attached in shreds, pulverulent, blackish, prominent; teliospores broadly ellipsoid, 32–42 by 48–61 μ, rounded at both ends, slightly constricted at septum; wall 3–5 μ thick, dark chestnut- or blackish-brown, sparsely and very conspicuously and irregularly tuberculate, the pore of lower cell midway between pedicel and septum; pedicel colorless, fragile, short.

This species is correlated with *Dicaeoma nodosum* (Ellis & Hark.) Kuntze and *Allodus Carnegiana* (Arth.) Orton. The morphological characters of like stages in the three species are similar or identical and together with the correspondence in hosts doubtless indicate a common origin.

ON LILIACEAE:

Dipterostemon pauciflorus (Torr.) Rydb. (*Brodiaea capitata pauciflora* Torr., *B. pauciflora* Standley), Arizona.

TYPE LOCALITY: Tumamoc Hill, Tucson, Arizona, on *Brodiaea capitata pauciflora*.

DISTRIBUTION: Known only from the type locality.

2. **Micropuccinia Moreniana** (Dudley & Thompson) Arthur & Jackson.

Puccinia Moreniana Dudley & Thompson, Jour. Myc. **10**: 53. 1904.
Allodus Moreniana Orton, Mem. N. Y. Bot. Gard. **6**: 182. 1916.

O. Pycnia unknown.

III. Telia chiefly hypophyllous, scattered or sometimes grouped, oval or oblong, 0.5–2 mm. wide by 1–5 mm. long, tardily naked, dark cinnamon-brown, slightly pulverulent, ruptured epidermis conspicuous; teliospores broadly ellipsoid, 20–24 by 33–50 μ, the cells equal in size and shape, rounded at both ends, moderately constricted at septum; wall light cinnamon-brown, about 2 μ thick, uniform, finely and inconspicuously striate with longitudinal rows of minute papillae; pedicel colorless, delicate, about length of spore.

This species is correlated with *Dicaeoma Pattersonianum* (Arth.) Arth. & Fromme. The telia of the two species possess common morphological characters, while the host of this species is doubtless the same or closely related to the probable aecial host of *D. Pattersonianum*, the latter having been located with much certainty but not proven by cultures.

ON LILIACEAE:

Dipterostemon capitatus (Benth.) Rydb. (*Brodiaea capitata* Benth.), California.

TYPE LOCALITY: Searsville Lake [San Mateo county], California, on *Brodiaea capitata*.

DISTRIBUTION: Known only from the type locality.

ILLUSTRATIONS: Holway, N. Am. Ured. **1**: *pl. 8, f. 35;* Proc. Ind. Acad. Sci. **1921**: *pl. 1, f. B.*

3. **Micropuccinia mesomajalis** (Berk. & Curt.) Arth. & Jackson; Arth. Bull. Torrey Club **48**: 41. 1921.

Puccinia mesomajalis Berk. & Curt.; Peck, Ann. Rep. N. Y. State Mus. **25**: 111. 1873.
Puccinia mesomegala Berk. & Curt. Grevillea **3**: 52. 1874.
Dicaeoma mesomegalum Kuntze, Rev. Gen. **3**^{3}: 469. 1898.
Dasyspora mesomegala Arth. Résult. Sci. Congr. Bot. Vienne 347. 1906.

O. Pycnia unknown.

III. Telia amphigenous, crowded and circinating upon yellowsh spots 5–15 mm. across, round, minute, 0.1–0.5 mm. in diameter, somewhat tardily naked, pulverulent, dark cinnamon-brown, ruptured epidermis conspicuous; teliospores narrowly ellipsoid or oblong, 15–24 by 26–40 μ, rounded or somewhat narrowed above and below, slightly constricted at septum; wall golden- or cinnamon-brown, 1.5–2.5 μ thick, thickened over the pores into a small colorless papilla, 3–5 μ, very closely and finely verrucose, usually appearing smooth in water; pedicel colorless, fragile, short.

ON CONVALLARIACEAE:

Clintonia borealis (Ait.) Raf., Michigan, Minnesota, New Hampshire, New York, Wisconsin; Nova Scotia.
Clintonia uniflora (Menzies) Kunth, California, Idaho, Montana, Oregon, Washington; British Columbia.

TYPE LOCALITY: Adirondack mountains, New York, on *Clintonia borealis*.
DISTRIBUTION: Northern border of the United States, and adjacent Canada.
ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 9, f. 38*.
EXSICCATI: Barth. N. Am. Ured. *48, 460, 461, 1460;* Ellis, N. Am. Fungi *1041;* Ellis & Ev. Fungi Columb. *756;* Rel. Farl. *262;* Thüm. Myc. Univ. *1126;* Sydow, Ured. *324, 1776*.

4. **Micropuccinia asarina** (Kunze) Arth. & Jackson; Arth. Bull. Torrey Club **48**: 40. 1921.

Puccinia asarina Kunze; Kunze & Schmidt, Myk. Hefte 1: 70. 1817.
Puccinia Asari Link, in Willd. Sp. Pl. 6^2: 68. 1825.
Dicaeoma asarinum Kuntze, Rev. Gen. 3^3: 467. 1898.
Dasyspora asarina Arth. Résult. Sci. Congr. Bot. Vienne 346. 1896.

O. Pycnia unknown.

III. Telia amphigenous or petiolicolous, crowded upon more or less bladdery or swollen areas 3–5 mm. across, round, 0.3–0.8 mm. in diameter, somewhat tardily naked, deep-seated, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; teliospores oblong or fusiform-oblong, 16–21 by 30–40 μ, rounded or narrowed above and below, constricted at septum; wall golden-brown, 1–2 μ thick, thickened at apex into an abrupt colorless umbo over the pore, 4–7 μ, smooth; pedicel colorless, fragile.

ON ARISTOLOCHIACEAE:

Asarum caudatum Lindl., California, Idaho, Oregon, Washington.
Asarum Lemmoni S. Wats., California.

TYPE LOCALITY: Saxony, on *Asarum europaeum*.
DISTRIBUTION: From Idaho to Washington and northern California; also in Europe.
ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 11, f. 48*.
EXSICCATI: Barth. Fungi Columb. *4840;* Barth. N. Am. Ured. *1218, 1524, 1525, 1931;* Sydow, Ured. *1060*.

5. **Micropuccinia ornata** (Arth. & Holway) Arth. & Jackson; Arth. Bull. Torrey Club **48**: 41. 1921.

Puccinia ornata Arth. & Holway; Arth. Bull. Geol. Nat. Hist. Surv. Minn. **3**: 30. 1887.
Dicaeoma ornatum Kuntze, Rev. Gen. 3^3: 469. 1898.
Dasyspora ornata Arth. Résult. Sci. Congr. Bot. Vienne 347. 1906.
Leptopuccinia ornata Sydow, Ann. Myc. **20**: 120. 1922.

O. Pycnia unknown.

III. Telia amphigenous, closely crowded or confluent and circinating in groups 3–8 mm. across upon larger reddish spots, round, 0.1–0.5 mm. in diameter, early naked, pulvinate, chocolate-brown becoming cinereous from germination, ruptured epidermis inconspicuous; teliospores oblong or ellipsoid-oblong, 16–24 by 35–48 μ, rounded or slightly narrowed above and below, constricted at septum; wall golden-brown, 2–3 μ thick, thickened at apex into a colorless umbo, 4–7 μ, smooth; pedicel colorless, as long as spore or longer.

This species is correlated with *Dicaeoma rubellum* (Pers.) Arth. & Fromme, the telial characters of the two species being similar or identical, and the hosts of the short-cycled form corresponding with the aecial hosts of the heteroecious form. These facts point to a common origin for the two species.

ON POLYGONACEAE:

Rumex Britannica L., Maine, Minnesota, New Hampshire, New York, Wisconsin.

TYPE LOCALITY: Vermilion Lake, Minnesota, on *Rumex Britannica*.
DISTRIBUTION: Northern border of the United States from Maine to Minnesota.
ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 11, f. 49*.
EXSICCATI: Barth. Fungi Columb. *4064;* Barth. N. Am. Ured. *2630;* Seym. & Earle, Econ. Fungi *379*.

6. **Micropuccinia Eurotiae** (D. Griff.) Arthur & Jackson.

Puccinia Eurotiae D. Griff. Bull. Torrey Club. **34** : 210. 1907.

O. Pycnia unknown.

III. Telia hypophyllous, crowded in elongate groups on each side of the midrib, round, 0.5–1 mm. in diameter, early naked, pulvinate, becoming pulverulent, chocolate-brown,

ruptured epidermis inconspicuous; teliospores ellipsoid, 23–26 by 32–40 μ, rounded at both ends, slightly constricted at septum, the two cells readily falling apart by splitting of septum; wall golden- or chestnut-brown, thick, 2–3.5 μ, with a pale subcuticular layer extending through the septum, best seen in lactic acid, sometimes slightly thickened at apex, 5–6 μ, smooth; pedicel colorless, up to three times length of spore.

This species is correlated with *Dicaeoma Eurotiae* (Ellis & Ev.) Arth., the telial characters of the two species being essentially the same, notably in the unique manner of cell-disjunction, as well as the host of the short-cycled form being the same as the aecial host of the heteroecious form. This agreement doubtless indicates a common origin for the two species.

ON CHENOPODIACEAE:

Eurotia lanata (Pursh) Moq., Nevada.
TYPE LOCALITY: Near Lovelocks, Nevada, on *Eurotia lanata.*
DISTRIBUTION: Known only from the type locality.

7. **Micropuccinia agnita** (Arth.) Arthur & Jackson.

Puccinia agnita Arth. Bull. Torrey Club **42**: 590. 1915.

O. Pycnia chiefly epiphyllous, loosely grouped on discolored spots, punctiform, noticeable, angularly globoid, 65–115 μ in diameter; ostiolar filaments about 35 μ long.

III. Telia chiefly hypophyllous, irregularly grouped on pale spots 4–6 mm. across, round or oblong, 0.2–0.8 mm. across, at first covered by the membranous epidermis, soon naked, very pulverulent, light chestnut-brown; teliospores ellipsoid, 21–27 by 29–42 μ, rounded or obtuse at both ends, slightly or not constricted at septum; wall golden-brown, 1.5–2 μ thick, thickened over the pores into a colorless papilla, 5–6 μ, rather inconspicuously verrucose, the pore of upper cell apical, of lower cell depressed two-thirds; pedicel colorless, fragile.

This species is correlated with *Allodus claytoniata* (Schw.) Arth., the telial characters of the two species being essentially alike, and the family of the known host of the short-cycled form being the same as that of the hosts of the long-cycled form.

ON PORTULACACEAE:

Claytonia megarrhiza (A. Gray) Parry, Colorado.
TYPE LOCALITY: Cumberland Mine, LaPlata Mountains, Colorado, on *Claytonia megarrhiza.*
DISTRIBUTION: Known only from the type locality.

8. **Micropuccinia detonsa** (Arth. & Holway) Arthur & Jackson.

Puccinia detonsa Arth. & Holway; Arth. Mycologia **10**: 130. 1918.

O. Pycnia unknown.

III. Telia hypophyllous and caulicolous, more or less confluent in round or elongate masses 1–2 mm. across, or sometimes scattered, on indefinite discolored areas, round, 0.3–0.6 mm. in diameter, early naked, pulvinate, light yellowish-brown, ruptured epidermis inconspicuous; teliospores oblong or fusiform-oblong, 12–15 by 30–40 μ, rounded or acute at apex, more or less narrowed below, somewhat constricted at septum; wall pale golden-brown, very thin, 1 μ or less, not or a little thickened above, up to 3 μ, smooth; pedicel colorless, about as long as spore.

ON CARYOPHYLLACEAE:

Stellaria ovata Willd., Costa Rica; Guatemala.
TYPE LOCALITY: San José, Costa Rica, on *Stellaria ovata.*
DISTRIBUTION: Central America.

9. **Micropuccinia Arenariae** (Schum.) Arth. & Jackson; Arth. Bull. Torrey Club **48**: 40. 1921.

Uredo Arenariae Schum. Enum. Pl. Saell. **2**: 232. 1803.
Uredo Alsines Schum. Enum. Pl. Saell. **2**: 232. 1803.
Puccinia Spergulae DC. Fl. Fr. **2**: 219. 1805.
Puccinia Dianthae DC. Fl. Fr. **2**: 220. 1805.
Puccinia Lychnites DC.; Poir. in Lam. Encyc. **8**: 247. 1808.
Uredo verrucosa Strauss, Ann. Wett. Ges. **2**: 107. 1810.
Puccinia Saginae Schmidt & Kunze, Deuts. Schwämme **9**: 6. 1819.
Puccinia Spergulae Arenariae-serpyllifoliae DC. Fl. Fr. **6**: 55. 1815.
Puccinia Lychnidearum Link. Ges. Nat. Freunde Berlin Mag. **7**: 25. 1815.
Puccinia crassa Link, Ges. Nat. Freunde Berlin Mag. **7**: 30. 1815.
Caeoma verrucosum Nees, Syst. Pilze Schw. 16. 1816.
Dicaeoma verrucosum Mart. Fl. Crypt. Erlang. 321. 1817.

Puccinia verrucosa Schlecht. Fl. Berol. **2**: 132. 1824.
Caeoma Arenariae Link, in Willd. Sp. Pl. **6**[2]: 27. 1825.
Puccinia Stellariae Duby, Bot. Gall. **2**: 887. 1830.
Puccinia caryophyllacearum Wallr. Fl. Crypt. Germ. **2**: 224. 1833.
Uredo Lychnidiarum Desmaz. Ann. Sci. Nat. II. **17**: 94. 1842.
Puccinia caryophyllacearum Spergulae Westend. Bull. Acad. Belg. **19**[3]: 124. 1852.
Puccinia Malachii L. Kirchn. Lotos **6**: 181. 1856.
Puccinia denticulata Otth, Mitth. Nat. Ges. Bern **1868**: 69. 1868.
Puccinia Agrostemmae Fuckel, Jahrb. Nass. Ver. Nat. **23–24**: 50. 1870.
Puccinia Moehringiae Fuckel, Jahrb. Nass. Ver. Nat. **23–24**: 51. 1870.
Puccinia circinans Fuckel, Jahr. Nass. Ver. Nat. **23–24**: 53. 1870.
Puccinia Arenariae Wint. in Rab. Krypt.-Fl. **1**[1]: 167. 1881.
Puccinia caudata Barclay, Jour. Asiat. Soc. Bengal **60**: 219. 1891.
Dicaeoma Arenariae Kuntze, Rev. Gen. **3**[3]: 467. 1898.
Dicaeoma Spergulae Kuntze, Rev. Gen. **3**[3]: 470. 1898.
Leptopuccinia Spergulae Rostr. Plant. Haandb. 270. 1902.
Leptopuccinia Dianthi Rostr. Plant. Haandb. 270. 1902.
Leptopuccinia Arenariae Rostr. Plant. Haandb. 271. 1902.
Dasyspora Arenariae Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.
Dasyspora Spergulae Arth. Résult. Sci. Congr. Bot. Vienne 347. 1906.

O. Pycnia unknown.

III. Telia amphigenous, chiefly hypophyllous and caulicolous, round or oval, scattered or gregarious on yellowish spots, often confluent, somewhat tardily naked, pulvinate, firm, at first cinnamon-brown, becoming blackish-brown, often cinereous from germination, ruptured epidermis conspicuous; teliospores fusiform or clavate, 13–19 by 32–50 μ, rounded or often acute above, rounded or more commonly narrowed below, somewhat constricted at septum; wall golden- or cinnamon-brown, 1–2 μ thick, thickened above to 10 μ, smooth; pedicel firm, colorless, once to twice length of spore.

ON CARYOPHYLLACEAE:

Alsine laeta (Richards.) Rydb. (*Stellaria longipes laeta* S. Wats.), Montana, Wyoming.
Alsine longipes (Goldie) Coville (*Stellaria longipes* Goldie), Alaska; Greenland.
Arenaria stricta Michx. (*A. Michauxii* Hook. f.), New York, Wisconsin.
Cerastium alpinum L., Greenland.
Cerastium strictum L. (*C. occidentale* Greene), Colorado, Montana.
Dianthus barbatus L., Connecticut, Massachusetts, Mississippi, New York, Pennsylvania.
Merckia physodes Fisch. (*Arenaria physodes* Fisch.), Northwest Territories.
Moehringia lateriflora (L.) Fenzl (*Arenaria lateriflora* L.), Maine, Montana.
Spergula arvensis L., Maine, New York.

TYPE LOCALITY: Island of Zealand, Denmark, on *Arenaria trinervia*.

DISTRIBUTION: Connecticut to northern Mississippi and central Colorado, northward to Greenland, Alaska, and the Arctic Ocean; also in Europe, Asia, and South America.

ILLUSTRATIONS: Corda, Ic. Fung. **4**: *pl. 4, f. 39;* Holway, N. Am. Ured. **1**: *pl. 15, f. 60a, b, c*; Fl. Ital. Crypt. Ured. *f. 68d;* Grove, Brit. Rust Fungi *f. 167–169*.

EXSICCATI: Barth. N. Am. Ured. *170, 924;* Ellis, N. Am. Fungi *1457;* Rel. Farl. *240;* Seym. & Earle, Econ. Fungi *263*.

10. **Micropuccinia hysteriiformis** (Peck) Arthur & Jackson.

Puccinia hysteriiformis Peck, Bot. Gaz. **6**: 276. 1881.
Dicaeoma hysteriiforme Kuntze, Rev. Gen. **3**[3]: 469. 1898.

O. Pycnia unknown, probably not formed.

III. Telia amphigenous, linear, 0.5–1.5 cm. long, tardily naked, firm, blackish, ruptured epidermis conspicuous; teliospores oblong or clavate, 16–20 by 32–46 μ, rounded above and below, slightly constricted at septum; wall light cinnamon-brown, 1–2 μ thick, greatly thickened at apex up to 8 μ, smooth; pedicel firm, colorless, or slightly tinted next to spore, once to once and a half length of spore.

ON CARYOPHYLLACEAE:

Arenaria congesta Nutt., Montana.
Arenaria uintahensis A. Nelson, Utah.

TYPE LOCALITY: Utah, on "*Arenaria verna*," error for *A. uintahensis*.
DISTRIBUTION: Northern Utah to central Montana.
ILLUSTRATION: Holway, N. Am. Ured. **1**: *pl. 15, f. 61*.
EXSICCATI: Ellis & Ev. Fungi Columb. *1963;* Garrett, Fungi Utah. *14;* Sydow, Ured. *1928*.

11. **Micropuccinia Pulsatillae** (Kalchbr.) Arth. & Jackson; Arth. Bull. Torrey Club **48**: 41. 1921.

Puccinia compacta DeBary, Bot. Zeit. **16**: 83. 1858. Not *P. compacta* Berk. 1855 (nor Thüm. 1875; nor Kunze, 1903).
Puccinia Pulsatillae Kalchbr. Math. Term. Közlem. **3**: 307. 1865.

Puccinia DeBaryana Thüm. Flora **58**: 364. 1875.
Puccinia Anemones-virginianae Wint. in Rab. Krypt.-Fl. **1**[1]: 170. 1881. Not *P. Anemones-virginianae* Schw. 1822.
Puccinia Trautvetteriae Sydow & Holway; Sydow, Monog. Ured. **1**: 552. 1903.
Dasyspora DeBaryana Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.
Sclerotelium compactum Sydow, Ann. Myc. **19**: 172. 1921.
Sclerotelium Trautvetteriae Sydow, Ann. Myc. **19**: 172. 1921.

O. Pycnia unknown, probably not formed.

III. Telia amphigenous, or sometimes chiefly epiphyllous or hypophyllous, irregularly roundish, 1–5 mm. across, occasionally elongate to 8–10 mm., on yellowish or purple spots which are frequently depressed beneath, blackish, firm, covered by shining epidermis, compound by irregular development of golden-brown stromal hyphae; teliospores oblong-clavate or cylindric, 12–22 by 30–75 μ, rounded or acute above, narrowed below, slightly constricted at septum which is usually above the middle; wall 1.5–3 μ thick, golden-brown below, somewhat darker and thicker above, 4–8 μ, smooth; pedicel tinted, short, firm, up to 12 μ long.

ON RANUNCULACEAE:

Anemone Drummondii S. Wats., Oregon.
Anemone parviflora Michx., British Columbia, Quebec.
Clematis lasiantha Nutt., California.
Pulsatilla ludoviciana (Nutt.) A. Heller (*P. hirsutissima* Britton, *Anemone patens Nuttalliana* A. Gray), Colorado, Iowa, North Dakota, South Dakota; Alberta, Saskatchewan.
Trautvetteria grandis Nutt., Idaho, Oregon, Washington; British Columbia.

TYPE LOCALITY: Olaszi, Szepes, Hungary (now Spáleny Vlakhy, Czecho-Slovakia), on *Anemone Pulsatilla*.

DISTRIBUTION: Northeastern Iowa to northern Colorado and central California, and northward, and in eastern Quebec; also in Europe, eastern Asia, and Japan.

ILLUSTRATIONS: Bull. Lab. Nat. Hist. Univ. Iowa **3**[2]: *pl. 2, f. 12b;* Holway, N. Am. Ured. **1**: *pl. 2, f. 9a-c; pl. 3, f. 15;* Krypt.-Fl. Brand. Pilze *f. B173a;* Beitr. Krypt. Schweiz *f. 258–260;* Sitz.-ber. Böhm. Ges. Wiss. **1901**[2]: *f. 13–25, 32–44;* Math. Term. Közlem. **3**: *pl. 2, f. 12.*

EXSICCATI: Arth. & Holway, Ured. Exs. Ic. *12b;* Barth. N. Am. Ured. *1437;* Brenckle, Fungi Dak. *61;* Ellis, N. Am. Fungi *1456;* D. Griff. W. Am. Fungi *273a.*

12. **Micropuccinia Anemones-virginianae** (Schw.) Arth. & Jackson; Arth. Bull. Torrey Club **48**: 40. 1921.

Puccinia Anemones-virginianae Schw. Schr. Nat. Ges. Leipzig **1**: 72. 1822.
Puccinia solida Schw. Trans. Am. Phil. Soc. II. **4**: 296. 1832.
Puccinia simplex Peck, Ann. Rep. N. Y. State Mus. **34**: 45. 1881.
Puccinia pallida Tracy, Jour. Myc. **7**: 281. 1893.
Dicaeoma solidum Kuntze, Rev. Gen. **3**[3]: 467. 1898.
Dicaeoma pallidum Kuntze, Rev. Gen. **3**[3]: 470. 1898.
Dicaeoma simplex Kuntze, Rev. Gen. **3**[3]: 470. 1898.
Dicaeoma Anemones-virginianae Arth. Proc. Ind. Acad. Sci. **1898**: 181. 1899.
Dasyspora Anemones-virginianae Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.
Puccinia missouriensis Arth. Bull. Torrey Club **45**: 146. in part. 1918.

O. Pycnia unknown, probably not formed.

III. Telia hypophyllous or caulicolous, rarely epiphyllous, on light-green spots often becoming purple, the upper surface usually slightly sunken, scattered, round, small, 0.5–1.5 mm. across, or occasionally gregarious and confluent covering considerable areas of leaf, early naked, pulvinate, compact, blackish-brown, often cinereous from germination, ruptured epidermis not conspicuous; teliospores clavate or cylindric, 12–16 by 35–60 μ, rounded or obtuse above, narrowed below, upper cell usually shorter than lower, slightly constricted at septum; wall golden-brown, slightly darker above, thin, 1–1.5 μ, thickened up to 5–10 μ at apex, smooth; pedicel firm, short, slightly tinted.

ON RANUNCULACEAE:

Anemone canadensis L. (*A. pennsylvanica* L.), Michigan, New York.
Anemone cylindrica A. Gray, Iowa, Michigan, Minnesota, Nebraska, New York, North Dakota, South Dakota, Wisconsin.
Anemone riparia Fernald, Maine, Vermont.
Anemone virginiana L., Connecticut, Delaware, Indiana, Iowa, Kansas, Minnesota, New Jersey, New York, North Carolina, North Dakota, Ohio, Pennsylvania, Tennessee, Vermont, Virginia, Wisconsin; Ontario, Quebec.

TYPE LOCALITY: North Carolina, on *Anemone virginiana*.

DISTRIBUTION: North Carolina to Kansas, and northward into Canada.

ILLUSTRATIONS: Bull. Lab. Nat. Hist. Univ. Iowa **3**[2]: *pl. 2, f. 12a;* Holway, N. Am. Ured. **1**: *pl. 2, f. 10;* Sitz.-ber. Böhm. Ges. Wiss. **1901**[2]: *f. 1–12;* Bot. Gaz. **14**: *pl. 15, f. 8–10.*

EXSICCATI: Arth. & Holway, Ured. Exs. Ic. *12a;* Barth. Fungi Columb. *3543, 4137, 4658;* Barth. N. Am. Ured. *19, 1130, 1331, 1831;* Brenckle, Fungi Dak. *289;* Ellis & Ev. Fungi Columb. *493, 1845;* Ellis & Ev. N. Am. Fungi *1847.*

13. **Micropuccinia gemella** (Dietel & Holway) Arthur & Jackson.

Puccinia gemella Dietel & Holway; Sydow, Monog. Ured. **1**: 541. 1903.

O. Pycnia unknown.

III. Telia amphigenous and petiolicolous, scattered, round or oblong, 0.8–1.5 mm. across, early naked, pulverulent, pale cinnamon- or chocolate-brown, ruptured epidermis conspicuous; teliospores fusiform or fusiform-oblong, 20–26 by 40–58 μ, narrowed above and below, not constricted at septum; wall chestnut-brown, rather thin, 1–1.5 μ, thickened into a lighter colored umbo at apex, 5–10 μ, smooth (sometimes teliospores 15–21 by 40–50 μ, germinating at once, the wall nearly colorless); pedicel colorless, fragile.

ON RANUNCULACEAE:

Caltha biflora DC., Oregon, Washington.
Caltha Howellii Greene, California.
Caltha leptosepala DC., Alaska, Idaho, Washington.

TYPE LOCALITY: Mt. Tacoma [Rainier], Washington, on *Caltha leptosepala*.
DISTRIBUTION: Locally in northwestern United States and southeastern Alaska.
ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 1, f. 3*.
EXSICCATI: Barth. Fungi Columb. *4057;* Barth. N. Am. Ured. *634;* Sydow, Ured. *1769*.

14. **Micropuccinia Treleasiana** (Paz.) Arthur & Jackson.

Puccinia Treleasiana Paz.; Rab.-Wint.-Paz. Fungi Eur. *3821* (Hedwigia **31**: 317). 1892.

O. Pycnia unknown.

III. Telia amphigenous and petiolicolous, scattered or somewhat gregarious, often confluent, round or oblong, 0.8–2 mm. across, early naked, pulverulent, chocolate-brown, ruptured epidermis conspicuous; teliospores ellipsoid, 19–25 by 33–48 μ, rounded or somewhat obtuse above and below, slightly or not constricted at septum; wall light chestnut-brown, rather thin, 1–2 μ, thickened into a low, pale umbo at apex, 3–6 μ, very minutely rugose, appearing smooth when wet; pedicel colorless, short, one-half length of spore.

ON RANUNCULACEAE:

Caltha biflora DC., Washington.
Caltha leptosepala DC., British Columbia.
Caltha rotundifolia (Huth) Greene (*C. leptophylla rotundifolia* Huth, *C. chionophila* Greene), Colorado, Nevada, Utah, Wyoming.

TYPE LOCALITY: Argentine Pass, Colorado, on *Caltha leptosepala*, now determined as *C. rotundifolia*.
DISTRIBUTION: Colorado northward into Canada.
ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 1, f. 5*.
EXSICCATI: Barth. Fungi Columb. *2470;* Barth. N. Am. Ured. *171;* Clements, Crypt. Form. Colo. *326;* Ellis & Ev. Fungi Columb. *1868;* Ellis & Ev. N. Am. Fungi *3244;* Garrett, Fungi Utah. *23;* Sydow, Ured. *1944;* Rab.-Wint. Fungi Eur. *3821*.

15. **Micropuccinia Delphinii** (Dietel & Holway) Arthur & Jackson.

Puccinia Delphinii Dietel & Holway; Dietel, Hedwigia **32**: 29. 1893.
Dicaeoma Delphinii Kuntze, Rev. Gen. 3^3: 468. 1898.

O. Pycnia not seen.

III. Telia chiefly hypophyllous and petiolicolous, small, round, 0.3–0.5 mm. across, gregarious and often confluent, covering large areas of leaf-surface, chestnut-brown, early naked, pulverulent, ruptured epidermis conspicuous; teliospores ellipsoid, 16–24 by 24–32 μ, rounded at both ends, scarcely constricted at septum; wall cinnamon-brown, uniformly thin, 1–1.5 μ, minutely and inconspicuously verrucose; pedicel short, fragile.

ON RANUNCULACEAE:

Delphinium sp., California.

TYPE LOCALITY: King's River Canyon, California, on *Delphinium* sp.
DISTRIBUTION: Known only from the type locality.
ILLUSTRATION: Holway, N. Am. Ured. **1**: *pl. 1, f. 6*.

16. **Micropuccinia andina** (Dietel & Neger) Arth. & Jackson; Arth. Bull. Torrey Club **48**: 40. 1921.

Puccinia Ranunculi Seym.; Burrill, Bot. Gaz. **9**: 191. 1884. Not *P. Ranunculi* A. Blytt, 1882.
Dicaeoma Ranunculi Kuntze, Rev. Gen. 3^3: 470. 1898.
Puccinia andina Dietel & Neger, Bot. Jahrb. **27**: 4. 1899.

Puccinia diffusa Holway, N. Am. Ured. **1**: 13. 1905.
Dasyspora Ranunculi Arth. Résult. Sci. Congr. Bot. Vienne 347. 1906.

O. Pycnia unknown.

III. Telia chiefly hypophyllous, numerous, scattered, commonly gregarious but not confluent, occupying large areas of leaf-surface, round, 0.4–0.8 mm. across, early naked, pulverulent, chestnut-brown, ruptured epidermis conspicuous; teliospores broadly ellipsoid, 18–24 by 24–35 μ, rounded above and below, scarcely constricted at septum; wall cinnamon-brown, uniformly thin, 1–1.5 μ, minutely and very inconspicuously verrucose-rugose; pedicel hyaline, fragile, short, occasionally laterally inserted; mesospores frequently intermingled.

ON RANUNCULACEAE:
Ranunculus septentrionalis Poir., Illinois.
Ranunculus sp., Mexico.
TYPE LOCALITY: Andes Mountains, Valdivia, Chile, on *Ranunculus peduncularis*.
DISTRIBUTION: One collection each in northern Illinois and Mexico; also in South America.
ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 3, f. 16*.

17. **Micropuccinia Ranunculi** (A. Blytt) Arth. & Jackson; Arth. Bull. Torrey Club **48**: 42. 1921.

Puccinia Ranunculi A. Blytt, Forh. Vid.-Selsk. Christ. **1882**[6]: 12. 1882.
Puccinia Blyttiana Lagerh. Bot. Notiser **1892**: 169. 1892.
Puccinia Nuttallii Ellis & Ev. Bull. Torrey Club **24**: 283. 1897.
Dicaeoma Blyttianum Kuntze, Rev. Gen. **3**[3]: 468. 1898.

O. Pycnia unknown.

III. Telia amphigenous, scattered or more commonly confluent, round, 0.5–2.5 mm. across, more elongate on petioles, somewhat tardily naked, pulverulent, blackish-brown, ruptured epidermis conspicuous; teliospores somewhat angularly ellipsoid or oblong, 19–26 by 32–45 μ, rounded or obtuse above, often narrowed below, not or scarcely constricted at septum; wall chestnut-brown, 1.5–2.5 μ thick, with an abrupt subhyaline papilla over pore of upper and lower cell, irregularly tuberculate, the markings sparsely scattered or in ridges; pedicel colorless, fragile, short.

A few spores (aeciospores?) occur in particularly vigorous sori in the Arizona collections, globoid, 16–20 by 18–24 μ; wall colorless or light golden-brown, 1–1.5 μ thick, very finely and closely verrucose, the pores obscure.

ON RANUNCULACEAE:
Cyrtorhyncha neglecta Greene, Colorado.
Cyrtorhyncha ranunculina Nutt. (*Ranunculus Nuttallii* A. Gray), Colorado, Wyoming.
Ranunculus Eschscholtzii Schlecht., Utah.
Ranunculus glaberrimus Hook., Colorado.
Ranunculus stenolobus Rydb., Utah.
Ranunculus subsagittatus (A. Gray) Greene, Arizona.
Ranunculus Suksdorfii A. Gray, Washington; British Columbia.
TYPE LOCALITY: Norway, on *Ranunculus auricomus*.
DISTRIBUTION: Central Colorado to Nevada, northward to British Columbia; also in Europe.
ILLUSTRATIONS: Beitr. Krypt. Schweiz **2**[2]: *f. 69;* Holway, N. Am. Ured. 1: *pl. 3, f. 17*.
EXSICCATI: Barth. N. Am. Ured. *2631;* Garrett, Fungi Utah. *109*.

18. **Micropuccinia Berberidis-trifoliae** (Dietel & Holway) Arthur & Jackson.

Puccinia Berberidis-trifoliae Dietel & Holway; Holway, Bot. Gaz. **31**: 328. 1901.

O. Pycnia unknown.

III. Telia hypophyllous, scattered, round, on discolored spots, conspicuously elevated, 0.5–5 mm. across, early naked, pulvinate, compact, dark chocolate-brown, ruptured epidermis not conspicuous; teliospores irregularly ellipsoid, clavate or terete, 15–24 by 30–50 μ, rounded, obtuse, or attenuate above, rounded or more commonly narrowed below, not or slightly constricted at septum; wall chestnut-brown, 1.5–2.5 μ thick, much thicker above, 4–13 μ, smooth or with a few indistinct striations most evident at apex; pedicel firm, concolorous, as long as spore; mesospores occasionally intermixed.

ON BERBERIDACEAE:
Mahonia Swaseyi (Buckl.) Fedde (*Berberis trifolia* Schultes), Mexico (state).
TYPE LOCALITY: Rio Hondo, near City of Mexico, Mexico, on *Berberis trifolia*.

DISTRIBUTION: Known only from the type locality.
ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 4, f. 20.*
EXSICCATI: Barth. N. Am. Ured. *1225.*

19. **Micropuccinia Brandegei** (Peck) Arthur & Jackson.

Puccinia Brandegei Peck, Bot. Gaz. **7**: 44. 1882.
Dicaeoma Brandegei Kuntze, Rev. Gen. **3**[3]: 468. 1898.

O. Pycnia unknown.

III. Telia amphigenous and caulicolous, crowded in groups 1–2 mm. across, round or oblong, 0.2–0.8 mm. across, somewhat tardily naked, pulverulent, bullate, cinnamon- or light chestnut-brown, ruptured epidermis conspicuous; teliospores ellipsoid or oblong, 18–21 by 29–34 μ, rounded or somewhat acute above and below, slightly constricted at septum; wall cinnamon-brown, thin, 1–1.5 μ, slightly thickened into a small colorless papilla over the pores, up to 2 μ, smooth; pedicel colorless, fragile.

ON FUMARIACEAE:

Capnoides Brandegei (S. Wats.) A. Heller (*Corydalis Brandegei* S. Wats.), Colorado.
TYPE LOCALITY: Colorado, on *Corydalis Brandegei.*
DISTRIBUTION: Known only from the type locality.

20. **Micropuccinia Dentariae** (Alb. & Schw.) Arthur & Jackson.

Uredo Dentariae Alb. & Schw. Consp. Fung. 129. 1805.
Caeoma Dentariae Link, in Willd. Sp. Pl. **6**[2]: 24. 1825.
Puccinia fusca Dentariae Wallr. Fl. Crypt. Germ. **2**: 220. 1833.
Puccinia Dentariae Fuckel, Jahrb. Nass. Ver. Nat. **25–26**: 295. 1871.

O. Pycnia not seen.

III. Telia amphigenous and caulicolous, the foliicolous sori small, 0.5–0.8 mm. across, gregarious on vesiculose-inflated areas, the caulicolous and petiolicolous sori on hypertrophied areas, often confluent, tardily naked, pulverulent, chestnut-brown, ruptured epidermis conspicuous; teliospores clavate or cylindric, 15–18 by 32–50 μ, rounded or obtuse above, rounded or somewhat narrowed below, slightly or noticeably constricted at septum; wall uniformly dark cinnamon-brown, 1.5–3 μ thick, slightly thickened above, 4–6 μ, smooth both when wet and dry in American collections, distinctly striate when dry in European collections; pedicel colorless, short, deciduous.

ON BRASSICACEAE:

Dentaria tenella Pursh, Oregon.
TYPE LOCALITY: Neuwied, Prussia, on *Dentaria bulbifera.*
DISTRIBUTION: Western Oregon; also in central and northern Europe.

21. **Micropuccinia Drabae** (Rudolphi) Arth. & Jackson; Arth. Bull. Torrey Club **48**: 40. 1921.

Puccinia Drabae Rudolphi, Linnaea **4**: 115. 1829.
Puccinia ambiens Rostr. Bot. Tidsskr. **11**: 75. 1879.
Puccinia Hazslinszkyi De-Toni, in Sacc. Syll. Fung. **7**: 692. 1888.
Puccinia Drabae arctica P. Henn.; Allesch. & Henn. Bibl. Bot. **8**[42a]: 41. 1897.
Dicaeoma Drabae Kuntze, Rev. Gen. **3**[3]: 468. 1898.
Puccinia Cochleariae Lindr. Acta Soc. Faun. Fl. Fenn. **22**[3]: 10. 1902.
Dasyspora Drabae Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.

O. Pycnia unknown.

III. Telia caulicolous, fruticolous or rarely hypophyllous, roundish, elliptic or elongate, frequently confluent, becoming pulverulent, chestnut-brown, long covered by the cinereous epidermis that finally breaks away in large pieces; teliospores broadly ellipsoid or oblong, 13–20 by 26–38 μ, rounded above and below, slightly or noticeably constricted at septum; wall dark cinnamon-brown, 1.5–3 μ, slightly or not thickened at apex, finely and evenly verrucose-rugose; pedicel colorless, fragile, deciduous.

ON BRASSICACEAE:

Cochlearia officinalis L. (*C. fenestrata* R. Br., *C. groenlandica* L.), Greenland.
Draba arabisans Michx., Quebec.
Draba globosa Payson, Utah.
Draba hirta L. (*D. arctica* Vahl), Greenland.
Draba incana L., Greenland.
Draba incerta Payson, Alberta.

TYPE LOCALITY: Near Muggendorf, Germany, on *Draba lasiocarpa*.
DISTRIBUTION: Southeastern Quebec to Greenland, and in northern Utah and northern Alberta; also in Europe.
ILLUSTRATIONS: Beitr. Krypt. Schweiz 2^2: *f. 105;* Holway, N. Am. Ured. 1: *pl. 17, f. 64.*
EXSICCATI: Garrett, Fungi Utah. *116.*

22. **Micropuccinia utahensis** (Garrett) Arthur & Jackson.

Puccinia utahensis Garrett; Holway, N. Am. Ured. 1: 46. 1906.
Puccinia Clementis Garrett, Mycologia 6: 249. 1914.

O. Pycnia unknown.

III. Telia amphigenous, scattered, round, 0.5–1.5 mm. across, occasionally confluent and elongate, somewhat tardily naked, becoming pulverulent, chocolate-brown, ruptured epidermis conspicuous; teliospores ellipsoid or oblong, often angular, 16–19 by 30–44 μ, rounded above, rounded or occasionally narrowed below, noticeably constricted at septum; wall light chestnut-brown, 1.5–2 μ thick, sub-hyaline papilla at apex, 3–5 μ, minutely and finely verrucose, occasionally in longitudinal lines; pedicel colorless, fragile, deciduous.

ON BRASSICACEAE:

Parrya platycarpa Rydb., Utah.
Thlaspi glaucum A. Nelson, Utah.

TYPE LOCALITY: [Big Cottonwood Canyon, Salt Lake County], Utah, on *Thlaspi glaucum.*
DISTRIBUTION: Northern Utah.
ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 18, f. 67.*
EXSICCATI: Garrett, Fungi Utah. *144.*

23. **Micropuccinia Thlaspeos** (Schubert) Arthur & Jackson.

Puccinia Thlaspeos Schubert; Ficinus & Schubert, Fl. Dresd. **2**: 254. 1823.
Puccinia Thlaspidis Vuill. Bull. Soc. Bot. Fr. **32**: 184. 1885.
Puccinia Vuilleminii De-Toni, in Sacc. Syll. Fung. **7**: 692. 1888.
Leptopuccinia Thlaspeos Sydow, Ann. Myc. **20**: 121. 1922.

O. Pycnia not seen.

III. Telia chiefly hypophyllous, evenly distributed over the surface of the leaf, occasionally scattered on upper surface, small, round, 0.3–0.5 mm. across, not confluent, early naked, pulvinate, light chestnut-brown, becoming cinereous from germination, ruptured epidermis not conspicuous; teliospores oblong or clavate, 14–18 by 32–45 μ, rounded above, rounded or more commonly narrowed below, slightly constricted at septum; wall thin, 1–1.5 μ, golden-brown, thicker above up to 8 μ, smooth; pedicel colorless, persistent, once to once and a half length of spore.

ON BRASSICACEAE:

Thlaspi glaucum A. Nelson, Colorado, Utah.
Thlaspi Nuttallii Rydb., Colorado.
Thlaspi purpurascens Rydb. (*T. alpestre* Am. Auth.), Idaho.

TYPE LOCALITY: Near Dresden, Germany, on *Thlaspi montanum.*
DISTRIBUTION: Southern Utah and Colorado to central Idaho; also in Europe.
ILLUSTRATIONS: Beitr. Krypt. Schweiz 2^2: *f. 226;* Holway, N. Am. Ured. 1: *pl. 17, f. 66.*
EXSICCATI: Garrett, Fungi Utah. *142.*

24. **Micropuccinia Holboellii** (Hornem.) Arth. & Jackson; Arth. Bull. Torrey Club **48**: 41. 1921.

Aecidium Holboellii Hornem. Fl. Dan. **37**: 11. 1840.
Puccinia Porteri Peck; Porter & Coult. Syn. Fl. Colo. 164. 1874.
Puccinia Barbarae Cooke, Grevillea **8**: 34. 1879.
Puccinia Cheiranthi Ellis & Ev.; Vasey, Bot. Gaz. **10**: 366. 1885.
Puccinia Holboellii Rostr. Medd. Grønland **3**: 534. 1888.
Puccinia palefaciens Dietel & Holway; Dietel, Erythea **2**: 128. 1894.
Dicaeoma Barbarae Kuntze, Rev. Gen. 3^3: 468. 1898.
Dicaeoma Cheiranthi Kuntze, Rev. Gen. 3^3: 468. 1898.
Dicaeoma Holboellii Kuntze, Rev. Gen. 3^3: 469. 1898.
Dicaeoma Porteri Kuntze, Rev. Gen. 3^3: 470. 1898.
Dasyspora palefaciens Arth. Résult. Sci. Congr. Bot. Vienne 347. 1906.
Leptopuccinia Holboelli Sydow, Ann. Myc. **20**: 120. 1922.

O. Pycnia amphigenous, numerous, conspicuous, scattered over upper surface of leaf or among the telia, or wanting, papillose, honey-yellow, globose, depressed-globose, or flask-shaped, 110–120 by 120–150 μ; ostiolar filaments 30–50 μ long, partially agglutinate.

III. Telia chiefly hypophyllous, evenly and closely distributed over the leaf, systemic,

occasionally scattered on the upper surface, round, 0.5–0.8 mm. across, early naked, cinnamon- or chestnut-brown, becoming cinereous from germination, ruptured epidermis noticeable; teliospores oblong or oblong-clavate, occasionally ellipsoid, 16–24 by 30–60 μ, rounded or obtuse above, rounded or more commonly narrowed below, not or slightly constricted at septum; wall nearly colorless or chestnut-brown, 1.5–2 μ thick, 5–8 μ above, smooth or obscurely striate; pedicel colorless, persistent, once to twice length of spore.

This species is correlated with *Dicaeoma monoicum* (Peck) Arth. & Fromme and *Allodus consimilis* (Ellis & Ev.) Orton, the morphological characters of like stages in the three species being similar or identical, and the hosts of the aecial stage of the heteroecious species corresponding with the hosts of the two autoecious species. This agreement doubtless indicates a common origin for the three species.

ON BRASSICACEAE:

Arabis ambigua DC., Alaska.
Arabis arcuata A. Gray, California.
Arabis Breweri S. Wats., California.
Arabis canescens Nutt., Nevada.
Arabis Crandallii B. L. Robinson, Colorado.
Arabis divaricarpa A. Nelson, Idaho; Alberta.
Arabis Drummondii A. Gray, Montana; British Columbia.
Arabis exilis A. Nelson, Colorado, Montana.
Arabis furcata S. Wats., Washington.
Arabis Holboellii Hornem., Greenland.
Arabis lignipes A. Nelson, Alberta.
Arabis Lyallii S. Wats., Montana, Washington; British Columbia.
Arabis lyrata occidentalis S. Wats., Alaska.
Arabis microphylla Nutt., California, Idaho.
Arabis perennans S. Wats., California.
Arabis retrofracta Graham (*A. Holboellii* Am. Auth.), Oregon, Utah.
Cheiranthus pygmaeus Adams, Grinnell Land.
Draba spectabilis Greene, Colorado, Utah.
Schoenocrambe linifolia (Nutt.) Greene (*Sisymbrium linifolium* Nutt.), Montana, Utah, Wyoming.
Schoenocrambe pinnata Greene, Colorado.
Smelowskia Fremontii S. Wats., Nevada.

TYPE LOCALITY: Greenland, on *Arabis Holboellii*.

DISTRIBUTION: Central Colorado to southern California northward to Alberta and southwestern Alaska, and from Greenland to Grinnell Land.

ILLUSTRATIONS: Bull. Lab. Nat. Hist. Univ. Iowa 3^2: *pl. 3, f. 17a, b;* Fl. Dan. *pl. 2220;* Holway, N. Am. Ured. 1: *pl. 15, f. 63a, pl. 16, f. 63b–g, pl. 17, f. 63h–j.*

EXSICCATI: Arth. & Holway, Ured. Exs. Ic. *17a, b;* Barth. N. Am. Ured. *149;* Ellis, N. Am. Fungi *1834;* Ellis & Ev. N. Am. Fungi *2889b, 2891;* Garrett, Fungi Utah. *4;* Sydow, Ured. *1926.*

25. **Micropuccinia Cruciferarum** (Rudolphi) Arth. & Jackson; Arth. Bull. Torrey Club **48**: 40. 1921.

Puccinia Cruciferarum Rudolphi, Linnaea **4**: 391. 1829.
Puccinia Cardamines Niessl, Verh. Nat. Ver. Brünn **10**: 164. 1872.
Puccinia Cardamines-bellidifoliae Dietel, Bot. Jahrb. **27**: 4. 1899.
Dasyspora Cruciferarum Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.

O. Pycnia unknown.

III. Telia amphigenous and petiolicolous, scattered or solitary, round, 0.5–2 mm. across, rarely confluent, often elongate when petiolicolous, early naked, becoming pulverulent, chestnut-brown, ruptured epidermis conspicuous; teliospores oblong or ellipsoid, 14–18 by 30–38 μ, rounded or obtuse above, rounded or occasionally narrowed below, noticeably constricted at septum; wall dark cinnamon-brown, 1–2 μ, with sub-hyaline umbo at apex, 3–5 μ thick, finely verrucose; pedicel colorless, usually deciduous.

ON BRASSICACEAE:

Cardamine bellidifolia L., Greenland; British Columbia.
Cardamine cordifolia A. Gray, Wyoming.

TYPE LOCALITY: Scandinavia, on *Cardamine bellidifolia.*
DISTRIBUTION: Southern Wyoming to British Columbia and Greenland; also in Europe.
ILLUSTRATION: Beitr. Krypt. Schweiz 2^2: *f. 104.*

26. **Micropuccinia aberrans** (Peck) Arthur & Jackson.

Puccinia aberrans Peck, Bot. Gaz. **4**: 217. 1879.
Dicaeoma aberrans Kuntze, Rev. Gen. 3^3: 467. 1898.

O. Pycnia amphigenous, scattered over large areas, preceding or among the telia, puncti-

form, honey-yellow, globose, 100–150 μ in diameter; ostiolar filaments delicate, agglutinate into a column, 30–80 μ long.

III. Telia amphigenous, chiefly hypophyllous, small, round, 0.3–0.5 mm. across, closely gregarious, covering large areas, at first pulvinate, early naked, chestnut-brown, becoming pulverulent, ruptured epidermis conspicuous; teliospores ellipsoid, oblong, or oblong-ovate, 22–28 by 35–45 μ, rounded or obtuse above, rounded or more commonly narrowed below, not or slightly constricted at septum; wall moderately thick, 2–3.5 μ, chestnut-brown, thickened above, 7–10 μ, obscurely verrucose-rugose, appearing smooth when wet; pedicel colorless, short, usually deciduous; mesospores and three-celled teliospores occur.

ON BRASSICACEAE:
Smelowskia americana Rydb. (*S. calycina* Am. Auth.), Colorado, Montana, Utah.
Smelowskia lobata Rydb., Nevada.
TYPE LOCALITY: Alta, Wasatch Mountains, Utah, on *Smelowskia calycina*.
DISTRIBUTION: Central Colorado to Nevada, northward to northern Montana.
ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 17, f. 65*.
EXSICCATI: Garrett, Fungi Utah. *52;* Rab.-Wint. Fungi Eur. *3505*.

27. **Micropuccinia Rydbergii** (Garrett) Arthur & Jackson.

Puccinia Rydbergii Garrett, Mycologia **6**: 251. 1914.

O. Pycnia unknown.

III. Telia amphigenous, scattered or crowded in small groups, round or elliptic, 0.2–1.2 mm. across, rather tardily naked, pulverulent, bullate, dark cinnamon-brown, ruptured epidermis conspicuous; teliospores ellipsoid, 16–20 by 26–32 μ, rounded above and below, or slightly narrowed below, slightly constricted at septum; wall cinnamon-brown, rather thick, 1.5–2.5 μ, sometimes somewhat thickened at apex, 3–4 μ, very closely and finely verrucose, the pore of upper cell apical, of lower cell in lower half of cell; pedicel colorless, fragile, short.

ON CRASSULACEAE:
Gormania debilis (S. Wats.) Britton (*Sedum debile* S. Wats.), Utah.
Sedum stenopetalum Pursh, Utah; British Columbia.
TYPE LOCALITY: Mountains above Gold Basin, LaSal Mountains, San Juan County, Utah, on *Sedum stenopetalum*.
DISTRIBUTION: Mountains of Utah and British Columbia.
EXSICCATI: Garrett, Fungi Utah. *220*.

28. **Micropuccinia Rhodiolae** (Berk. & Br.) Arthur & Jackson.

Puccinia Rhodiolae Berk. & Br. Ann. Mag. Nat. Hist. II. **5**: 462. 1850.
Puccinia Rhodiolae A. Blytt, Forh. Vid.-Selsk. Christ. **1882**^{6}: 10. 1882.
Puccinia Blyttii De-Toni, in Sacc. Syll. Fung. **7**: 700. 1888.
Dicaeoma Blyttii Kuntze, Rev. Gen. **3**^{3}: 468. 1898.
Dicaeoma Rhodiolae Kuntze, Rev. Gen. **3**^{3}: 470. 1898.

O. Pycnia unknown.

III. Telia amphigenous, crowded in groups 5–10 mm. across, round or oblong, 0.2–0.7 mm. in diameter, early naked, pulverulent, cinnamon-brown, ruptured epidermis conspicuous; teliospores broadly ellipsoid, 20–26 by 28–32 μ, rounded above and below, not constricted at septum; wall cinnamon-brown, 1.5–2 μ thick, slightly thickened over the pores into a light-colored papilla, up to 3 μ, smooth or occasionally with a few irregular lines of verrucose markings, the pore of upper cell apical, of lower cell near pedicel; pedicel colorless, short, fragile.

ON CRASSULACEAE:
Rhodiola integrifolia Raf. (*Sedum Rhodiola* Coult. not DC.), Colorado.
TYPE LOCALITY: Glen Callater, Scotland, on *Sedum Rhodiola*.
DISTRIBUTION: Central Colorado; also in northern Europe.
ILLUSTRATIONS: Holway, N. Am. Ured. 1: *pl. 23, f. 80;* Grove, Brit. Rust Fungi *f. 157*.
EXSICCATI: Clements, Crypt. Form. Colo. *575*.

29. [**Micropuccinia laurentiana** (Trel.) Arthur & Jackson.

Puccinia laurentiana Trel. Harriman Alaska Exp. Crypt. 38. 1904.

O. Pycnia unknown.

III. Telia hypophyllous, round, about 1 mm. in diameter, pulverulent, chestnut-brown;

teliospores oblong, 18–20 by 40–50 μ, rounded or obtuse above, rounded or narrowed below, strongly constricted at septum; wall chestnut-brown, 3–3.5 μ thick, thickened by colorless papilla to 8 μ at apex, smooth; pedicel colorless, fragile, once to once and a half length of spore.

ON SAXIFRAGACEAE:

Ocrearia nudicaulis (D. Don) Small (*Saxifraga nudicaulis* D. Don), Alaska.
TYPE LOCALITY: St. Lawrence Island, Bering Sea, on "*Saxifraga neglecta stolonifera*," now interpreted as *S. nudicaulis*.
DISTRIBUTION: Known only from the type locality.
ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 18, f. 70a, b.*

30. **Micropuccinia pallido-maculata** (Ellis & Ev.) Arthur & Jackson.

Puccinia pallido-maculata Ellis & Ev.; Holway, N. Am. Ured. 1: 49. 1906.

O. Pycnia unknown.

III. Telia amphigenous, small, round, 0.5–0.8 mm. across, gregarious and confluent, often circinate on pale-yellowish spots 1–3 mm. across, early naked, chestnut-brown, pulverulent, ruptured epidermis conspicuous; teliospores somewhat irregularly fusiform, or more rarely ellipsoid or oblong, 13–16 by 26–38 μ, obtuse above and below, not constricted at septum; wall 1.5–2 μ thick, the apex and the pore of lower cell at septum covered by an abrupt hyaline papilla, 3–4 μ thick, smooth; pedicel colorless, short, deciduous.

ON SAXIFRAGACEAE:

Micranthes arguta (D. Don) Small (*Saxifraga arguta* D. Don, *S. punctata* Am. Auth.), Colorado, Idaho, Montana, Utah.
Micranthes Lyallii (Engler) Small (*Saxifraga Lyallii* Engler), Alberta.
TYPE LOCALITY: Sangre de Christo Range, Colorado, on *Saxifraga punctata*.
DISTRIBUTION: Mountains of Colorado and Utah northward to Alberta.
ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 19, f. 73a, b.*
EXSICCATI: Barth. N. Am. Ured. *1562;* Ellis & Ev. N. Am. Fungi *2234;* Garrett, Fungi Utah. *34;* Sydow, Ured. *1933.*

31. **Micropuccinia Heucherae** (Schw.) Arth. & Jackson; Arth. Bull. Torrey Club 48: 41. 1921.

Uredo Heucherae Schw. Schr. Nat. Ges. Leipzig 1: 71. 1822.
Puccinia Saxifragae Schlecht. Fl. Berol. 2: 134. 1824.
Caeoma Heucherae Link, in Willd. Sp. Pl. 6^2: 28. 1825.
Puccinia Tiarellae Berk. & Curt. Grevillea 3: 53. 1874.
Puccinia spreta Peck, Ann. Rep. N. Y. State Mus. 29: 67. 1878.
Puccinia congregata Ellis & Hark. Bull. Calif. Acad. 1: 26. 1884.
Puccinia Heucherae Dietel, Ber. Deuts. Bot. Ges. 9: 42. 1891.
Dicaeoma Saxifragarum Kuntze, Rev. Gen. 3^3: 467. 1898.
Dicaeoma congregatum Kuntze, Rev. Gen. 3^3: 468. 1898.
Dicaeoma Tiarellae Kuntze, Rev. Gen. 3^3: 470. 1898.
Dicaeoma spretum Kuntze, Rev. Gen. 3^3: 470. 1898.
Micropuccinia Saxifragae Rostr. Medd. Grønland 30: 114. 1904.
Dasyspora Saxifragae Arth. Résult. Sci. Congr. Bot. Vienne 347. 1906.

O. Pycnia unknown, probably not formed.

III. Telia amphigenous and caulicolous, chiefly hypophyllous, scattered or gregarious and frequently confluent, occasionally circinate, 0.5–3 mm. across, early naked, chestnut- or chocolate-brown, flat and pulverulent, or in germinating condition pulvinate and cinereous, ruptured epidermis usually not conspicuous; teliospores ellipsoid, oblong or somewhat fusiform, 13–19 by 28–45 μ, rounded or obtuse above, rounded or narrowed below, slightly or not constricted at septum; wall light cinnamon-brown, 1–2 μ thick, with broad thickening above up to 8 μ, or with sub-hyaline papilla, smooth, or with evident longitudinal striae; pedicel colorless, fragile, twice length of spore or shorter, deciduous.

ON SAXIFRAGACEAE:

Heterisia Mertensiana (Bong.) Small (*Saxifraga Mertensiana* Bong.), Idaho, Washington.
Heuchera americana L., North Carolina.
Heuchera bracteata (Torr.) Seringe, Colorado.
Heuchera cylindrica Dougl., Washington.
Heuchera elegans Abrams, California.
Heuchera glabella T. & G., Washington.
Heuchera glabra Willd., Alaska; British Columbia.
Heuchera Hallii A. Gray, Colorado.

Heuchera micrantha Dougl., California, Oregon.
Heuchera rubescens Torr., Arizona.
Heuchera villosa Michx., North Carolina.
Heuchera sp., Idaho.
Leptaxis Menziesii (Pursh) Raf. (*Tolmiea Menziesii* T. & G., *Heuchera Menziesii* Hook.), Oregon.
Lithophragma affinis A. Gray (*Tellima affinis* Boland.), California.
Micranthes arguta (D. Don) Small (*Saxifraga arguta* D. Don, *S. punctata* Am. Auth. not L.), Colorado, Idaho, Montana, New Mexico, Utah, Washington.
Micranthes fragosa (Suks.) Small (*Saxifraga fragosa* Suks.), Washington.
Micranthes Nelsoniana (D. Don) Small (*Saxifraga Nelsoniana* D. Don), Alaska.
Mitella diphylla L., Iowa, Michigan, New York, Pennsylvania, Wisconsin; Ontario.
Mitella nuda L., Maine, Michigan, Montana, New York, Wisconsin; Ontario.
Ozomelis stauropetala (Piper) Rydb. (*Mitella stauropetala* Piper), Idaho.
Pectiantia Breweri (A. Gray) Rydb. (*Mitella Breweri* A. Gray), California, Oregon, Washington; British Columbia.
Pectiantia ovalis (Greene) Rydb. (*Mitella ovalis* Greene), Oregon,
Pectiantia pentandra (Hook.) Rydb. (*Mitella pentandra* Hook.), Colorado, Idaho, Utah, Washington.
Tellima grandiflora (Pursh) Dougl. (*Mitella grandiflora* Pursh), Alaska, California, Oregon, Washington; British Columbia.
Tiarella cordifolia L., Michigan, New York, Vermont, West Virginia; Ontario, Quebec.
Tiarella trifoliata L., Alaska, Washington.
Tiarella unifoliata Hook., Idaho, Montana, Oregon, Washington; British Columbia.

TYPE LOCALITY: North Carolina, on *Heuchera americana*.

DISTRIBUTION: Nearly throughout the United States and Canada; also in Europe.

ILLUSTRATIONS: Bull. Lab. Nat. Hist. Univ. Iowa **3**[2]: *pl. 1, f. 5, 6a, b;* Holway, N. Am. Ured. **1**: *pl. 18, f. 69, pl. 20, f. 74a–f, pl. 21, f. 74g–j;* Krypt.-Fl. Brand. Pilze **3**: *B14;* Ured. Schweiz **2**[2]: *f. 117;* Ber. Deuts. Bot. Ges. **9**: *pl. 3, f. 3, 8–11;* Grove, Brit. Rust Fungi *f. 160.*

EXSICCATI: Arth. & Holway, Ured. Exs. Ic. *5, 6a, b;* Barth. Fungi Columb. *2359, 3171, 4462, 4965;* Barth. N. Am. Ured. *40, 241, 454, 640, 745, 849, 1449, 1450, 1451, 1552, 1553, 1554;* Clements, Crypt. Form. Colo. *143;* Ellis, N. Am. Fungi *1049, 1463, 1464;* Ellis & Ev. Fungi Columb. *345, 1763, 2059;* Ellis & Ev. N. Am. Fungi *2233, 2414, 3571;* Garrett, Fungi Utah. *58, 108;* Sydow, Ured. *338, 867, 1917, 1925; 2417.*

32. **Micropuccinia curtipes** (Howe) Arth. & Jackson, Bull. Torrey Club **48**: 42. 1921.

Puccinia curtipes Howe, Bull. Torrey Club **5**: 3. 1874.
Puccinia striata Cooke, Grevillea **7**: 3. 1878.
Puccinia Saxifragae curtipes Dietel, Ber. Deuts. Bot. Ges. **9**: 40. 1891.
Dicaeoma curtipes Kuntze, Rev. Gen. **3**[3]: 468. 1898.
Puccinia striatospora Peck, Mycologia **5**: 71. 1913.

O. Pycnia unknown, probably not formed.

III. Telia amphigenous, chiefly hypophyllous, round, 0.5–0.8 mm. across, usually confluent in irregular groups, often elongate when on petioles and veins, usually pulverulent, rarely pulvinate in the germinating condition, chestnut-brown, early naked, ruptured epidermis noticeable; teliospores 16–20 by 26–34 μ, broadly ellipsoid or oblong, usually rounded above and below, occasionally narrower below, not or slightly constricted at septum; wall dark cinnamon-brown, 1–2.5 μ thick, with a colorless papilla at apex, 4–7 μ high, usually strongly striate; pedicel colorless, as long as spore, or more commonly short, deciduous.

ON SAXIFRAGACEAE:

Heuchera americana L., South Dakota, Wisconsin.
Heuchera bracteata (Torr.) Seringe, Colorado, Wyoming.
Heuchera cylindrica Dougl., Washington.
Heuchera glabella T. & G., Montana, Washington.
Heuchera hispida Pursh, Nebraska, North Dakota, South Dakota.
Heuchera ovalifolia Nutt., Alberta.
Heuchera parvifolia Nutt., Colorado, New Mexico, Utah, Wyoming.
Heuchera rubescens Torr., Utah.
Micranthes californica (Greene) Small (*Saxifraga californica* Greene), California, Oregon.
Micranthes columbiana (Piper) Small (*Saxifraga columbiana* Piper), Idaho.
Micranthes Marshallii (Greene) Small (*Saxifraga Marshallii* Greene), Oregon.
Micranthes nivalis (L.) Small (*Saxifraga nivalis* L.), Greenland.
Micranthes pennsylvanica (L.) Haw. (*Saxifraga pennsylvanica* L.), Indiana, Minnesota.
Micranthes virginiensis (Michx.) Small (*Saxifraga virginiensis* Michx.), California, New Jersey, New York, Ohio, Pennsylvania, West Virginia.
Ozomelis stauropetala (Piper) Rydb. (*Mitella stauropetala* Piper), Idaho, Wyoming.
Ozomelis stenopetala (Piper) Rydb. (*Mitella stenopetala* Piper, *M. trifida* S. Wats., not Graham), Utah.
Pectiantia Breweri (A. Gray) Rydb. (*Mitella Breweri* A. Gray), California.
Saxifraga debilis Engelm., Utah.
Saxifraga rivularis L., Montana; British Columbia.

TYPE LOCALITY: Yonkers, New York, on leaves of *Saxifraga* [*virginiensis*].
DISTRIBUTION: West Virginia to Colorado and central California and northward into arctic regions; also in northern Norway.
ILLUSTRATIONS: Bull. Lab. Nat. Hist. Univ. Iowa 3^2: *pl. 1, f. 7;* Holway, N. Am. Ured. 1: *pl. 18, f. 68a, b;* Ber. Deuts. Bot. Ges. 9: *pl. 3, f. 4–6.*
EXSICCATI: Arth. & Holway, Ured. Exs. Ic. *7;* Barth. N. Am. Ured. *736, 1539;* Brenckle, Fungi Dak. *63;* Clements, Crypt. Form. Colo. *557;* Ellis, N. Am. Fungi *1034, 1465;* Ellis & Ev. Fungi Columb. *1379, 1575, 2143;* Ellis & Ev. N. Am. Fungi *2242;* Garrett, Fungi Utah. *39, 40, 134, 212;* D. Griff. W. Am. Fungi *272;* Sydow, Ured. *1320, 1916.*

33. **Micropuccinia Lithophragmae** (Holway) Arthur & Jackson.

Puccinia Lithophragmae Holway, N. Am. Ured. 1: 51. 1906.

O. Pycnia unknown.

III. Telia chiefly hypophyllous and petiolicolous, round, 0.5–1 mm. across, scattered or more commonly closely gregarious, becoming confluent in groups 2–4 mm. in diameter, elongate on petioles, soon naked, pulverulent, chestnut-brown, ruptured epidermis conspicuous; teliospores ellipsoid or oblong, 16–20 by 30–44 μ, rounded or obtuse above, rounded or narrowed below, slightly or not constricted at septum; wall uniformly 1.5–2 μ thick with conic hyaline papilla over pores, prominently longitudinally striate-rugose; pedicel colorless, short, deciduous.

ON SAXIFRAGACEAE:

Lithophragma parviflora (Hook.) Nutt. (*Tellima parviflora* Hook.), Utah.
TYPE LOCALITY: Wasatch Mountains, Salt Lake County, Utah, on *Lithophragma parviflora.*
DISTRIBUTION: Known only from the type locality.
ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 21, f. 75a, b.*
EXSICCATI: Garrett, Fungi Utah. *137.*

34. **Micropuccinia Heterisiae** (H. S. Jackson) Arth. & Jackson; Arth. Bull. Torrey Club **48**: 41. 1921.

Puccinia aspera Dietel & Holway; Arth. Bull. Torrey Club **29**: 230. 1902. Not *P. aspera* Bon. 1869.
Dasyspora aspera Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.
Puccinia Heterisiae H. S. Jackson; Arth. Bull. Torrey Club **47**: 471. 1920.

O. Pycnia unknown, probably not formed.

III. Telia amphigenous, round, large, 0.5–2 mm. across, early naked, pulverulent, chestnut-brown, ruptured epidermis conspicuous; teliospores somewhat irregularly ellipsoid, oblong or clavate, 16–23 by 32–45 μ, rounded or rarely obtuse above, rounded or narrowed below, not or very slightly constricted at septum; wall dark cinnamon-brown, 1.5–2.5 μ thick, scarcely thickened at apex but pore of upper cell covered by sub-hyaline papilla, closely and irregularly verrucose; pedicel colorless, short, as long as spore, or more commonly deciduous.

ON SAXIFRAGACEAE:

Heterisia Mertensiana (Bong.) Small (*Saxifraga Mertensiana* Bong.), Montana, Washington,
TYPE LOCALITY: Mt. Paddo [Mt. Adams], Washington, on *Saxifraga Mertensiana.*
DISTRIBUTION: Northern Montana to central Washington.
ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 19, f. 71a, b.*
EXSICCATI: Barth. N. Am. Ured. *619.*

35. **Micropuccinia turrita** (Arth.) Arth. & Jackson; Arth. Bull. Torrey Club **48**: 42. 1921.

Puccinia turrita Arth. Bull. Torrey Club **29**: 230. 1902.
Dasyspora turrita Arth. Résult. Sci. Congr. Bot. Vienne 347. 1906.

O. Pycnia unknown.

III. Telia amphigenous, roundish, 0.5–1 mm. across, early naked, chestnut-brown, pulverulent, ruptured epidermis conspicuous; teliospores ellipsoid or oblong, 20–24 by 36–45 μ, rounded or obtuse above, rounded below, slightly constricted at septum; wall chestnut-brown, 1.5–2.5 μ thick, thickened at apex by sub-hyaline umbo to 7 μ, coarsely and irregularly tuberculate, especially at apex, the pore of lower cell variously placed from near septum to near pedicel; pedicel colorless, very short.

ON SAXIFRAGACEAE:

Leptasea austromontana (Wieg.) Small (*Saxifraga austromontana* Small, *S. bronchialis* Pursh), Colorado, Utah.

TYPE LOCALITY: Manitou, Colorado, on *Saxifraga bronchialis*.
DISTRIBUTION: Central Colorado to southeastern Utah.
ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 20, f. 72a, b*.
EXSICCATI: Garrett, Fungi Utah. *221*.

36. **Micropuccinia Saxifragae-tricuspidatae** (P. Henn.) Arthur & Jackson.

Puccinia Saxifragae-tricuspidatae P. Henn.; Allesch. & Henn. Bibl. Bot. 8^{42a}: 41. 1897.

O. Pycnia unknown.

III. Telia hypophyllous, scattered, or sometimes confluent, round, early naked, pulvinate, golden-brown, ruptured epidermis evident; teliospores broadly ellipsoid, 19–23 by 32–40 μ, rounded or obtuse above, constricted at septum; wall chestnut-brown, thin, not or slightly thickened at apex, finely verrucose appearing smooth; pedicel colorless, long, deciduous.

ON SAXIFRAGACEAE:
Leptasea tricuspidata (Retz) Haw. (*Saxifraga tricuspidata* Retz), Greenland.
TYPE LOCALITY: Karajak-Nunatak, Greenland, on *Saxifraga tricuspidata*.
DISTRIBUTION: Eastern Greenland.

37. **Micropuccinia Jueliana** (Dietel) Arthur & Jackson.

Puccinia Jueliana Dietel, Hedwigia **36**: 298. 1897.

O. Pycnia unknown, probably not formed.

III. Telia amphigenous, scattered or occasionally gregarious and confluent, round, 0.5–1 mm. in diameter, tardily naked, pulverulent, chocolate-brown, ruptured epidermis conspicuous; teliospores oblong or oblong-cylindric, 15–18 by 30–42 μ, rounded or obtuse above, rounded or occasionally somewhat narrowed below, strongly constricted at septum; wall light chestnut-brown, 2–2.5 μ thick, thicker above, 5–7 μ, with a broad and somewhat lighter umbo, noticeably rugose when dry, obscurely verrucose-rugose when wet; pedicel colorless, short, deciduous.

ON SAXIFRAGACEAE:
Spatularia Brunoniana (Bong.) Small (*Saxifraga nootkana* Moc.), British Columbia.
TYPE LOCALITY: Röisheim, Norway, on *Saxifraga aizoides*.
DISTRIBUTION: Mountains of British Columbia; also in alpine regions of Europe.
ILLUSTRATION: Beitr. Krypt. Schweiz 2^2: *f. 116*.

38. **Micropuccinia Parnassiae** (Arth.) Arth. & Jackson; Arth. Bull. Torrey Club **48**: 41. 1921.

Puccinia Parnassiae Arth. Bull. Torrey Club **31**: 3. 1904.
Dasyspora Parnassiae Arth. Résult. Sci. Congr. Bot. Vienne 347. 1906.

O. Pycnia unknown.

III. Telia amphigenous, scattered or somewhat gregarious, pustular, coalescing, soon naked, pulverulent, chocolate-brown, membranous epidermis conspicuous; teliospores ellipsoid or oblong, occasionally somewhat angular, 16–20 by 30–36 μ, rounded or obtuse at either end, scarcely constricted at septum; wall uniformly 1–2 μ thick, chestnut-brown, minutely verrucose especially on the upper cell, usually with hyaline papilla over the pore, which is apical in upper cell and either at septum or slightly below it in lower cell; pedicel colorless, half length of spore or less, usually deciduous.

ON PARNASSIACEAE:
Parnassia fimbriata Banks, Utah; Alberta, British Columbia.
TYPE LOCALITY: Banff, Alberta, on *Parnassia fimbriata*.
DISTRIBUTION: High altitudes from northern Utah to British Columbia.
ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 22, f. 77a, b*.
EXSICCATI: Garrett, Fungi Utah. *24*; Sydow, Ured, *1934*.

39. **Micropuccinia Ribis** (DC.) Rostr. Plantep. Haandb. 266. 1902.

Puccinia Ribis DC. Fl. Fr. **2**: 221. 1805.
Puccinia bullata Link, Ges. Nat. Freunde Berlin Mag. **7**: 29. 1815.
Dicaeoma Ribis S. F. Gray, Nat. Arr. Brit. Pl. **1**: 542. 1821.

Puccinia Acerum Link, in Willd. Sp. Pl. 6^2: 80. 1825.
Puccinia granulata DeBary; Klotzsch, Herb. Viv. Myc. ed. 2. *499*. 1857; Bot. Zeit. **15**: 174. 1857.
Puccinia pulchella Peck, Bull. Buffalo Soc. Nat. Sci. **1**: 66. 1873.
Puccinia Ribis papillifera Lagerh. Hedwigia **28**: 107. 1889.
Dicaeoma pulchellum Kuntze, Rev. Gen. 3^3: 470. 1898.
Dasyspora Ribis Arth. Résult. Sci. Congr. Bot. Vienne 347. 1906.

O. Pycnia unknown.

III. Telia mostly epiphyllous, circinating on yellowish or reddish spots 2–3 mm. in diameter, round or oblong, 0.3–0.8 mm. across, rather early naked, pulverulent, dark chestnut-brown, ruptured epidermis evident; teliospores oblong or narrowly ellipsoid, 13–19 by 26–35 μ, rounded at both ends, not or slightly constricted at septum; wall dark cinnamon-brown, rather thick, 1.5–2.5 μ, thickened into a low semi-hyaline umbo over the pores, 3–5 μ, closely and noticeably verrucose, the pore of upper cell apical, of lower cell usually near pedicel; pedicel colorless, fragile, short.

ON GROSSULARIACEAE:

Ribes glandulosum Grauer (*R. prostratum* L'Hér.), Maine, New York, Vermont, Wisconsin.
Ribes rubrum L., Michigan, Minnesota, Wisconsin.
Ribes triste Pall., Maine.
Ribes vulgare Lam., Minnesota.

TYPE LOCALITY: France, on red currant [*Ribes rubrum*].

DISTRIBUTION: Northern border of the United States from Maine westward to Minnesota; also in Europe.

ILLUSTRATIONS: Beitr. Krypt. Schweiz 2^2: *f. 112;* Corda, Ic. Fung. **4**: *pl. 5, f. 60;* Holway, N. Am. Ured. **1**: *pl. 22, f. 79a, pl. 23, f. 79b, c;* Ber. Deuts. Bot. Ges. **9**: *pl. 3, f. 16;* Grove, Brit. Rust Fungi *f. 159.*

EXSICCATI: Barth. Fungi Columb. *2674;* Barth. N. Am. Ured. *363;* Thüm. Myc. Univ. *544.*

40. **Micropuccinia Parkerae** (Dietel & Holway) Arthur & Jackson.

Puccinia Parkerae Dietel & Holway; Dietel, Erythea **3**: 78. 1895.

O. Pycnia not known.

III. Telia hypophyllous and petiolicolous, crowded in groups 2–6 mm. in diameter opposite reddish spots, often causing distention of leaf in infected areas, round or oblong, large, 0.5–3 mm. long, rather early naked, pulvinate, brownish-black, ruptured epidermis conspicuous; teliospores oblong or clavate-oblong, 13–16 by 32–53 μ, rounded or oblique above, narrowed below, constricted at septum; wall chestnut-brown above, lighter below, 1.5–2 μ thick, thickened at apex, 5–12 μ, smooth; pedicel colorless, up to twice length of spore.

This species is correlated with *Dicaeoma Grossulariae* (Schum.) Kern, the telial characters of the two species being similar or identical, and the host of the short-cycled form corresponding with the aecial hosts of the heteroecious form. This agreement doubtless indicates a common origin for the two species.

ON GROSSULARIACEAE:

Ribes lacustre (Pers.) Poir. (*Limnobotrya lacustris* Rydb.), Oregon, Washington; British Columbia.

TYPE LOCALITY: Seattle, Washington, on *Ribes lacustre.*

DISTRIBUTION: Oregon northward into British Columbia.

ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 22, f. 78.*

EXSICCATI: Barth. N. Am. Ured. *52;* Ellis & Ev. Fungi Columb. *753;* Ellis & Ev. N. Am. Fungi *3242.*

41. **Micropuccinia Sieversiae** (Arth.) Arthur & Jackson.

Puccinia Sieversiae Arth. Bull. Torrey Club **31**: 3. 1904.

O. Pycnia unknown.

III. Telia mostly hypophyllous, scattered, round or oblong, 0.3–1 mm. across, somewhat tardily naked, bullate, pulverulent, chestnut-brown, ruptured epidermis conspicuous; teliospores ellipsoid or ellipsoid-oblong, 16–22 by 30–39 μ, rounded above and below, not constricted at septum; wall cinnamon-brown, 1.5–2.5 μ thick, thickened at apex into a low, semi-hyaline umbo, 4–6 μ, rather obscurely rugose; pedicel colorless, short, fragile.

ON ROSACEAE:

Acomastylis turbinata (Rydb.) Greene (*Geum turbinatum* Rydb., *Sieversia turbinata* Greene), Colorado, Utah.

TYPE LOCALITY: Fish Lake, Uintah Mountains., Utah, on *Sieversia turbinata.*

DISTRIBUTION: Northwestern Utah and adjacent Colorado.

ILLUSTRATION: Holway, N. Am. Ured. 1: *pl. 23, f. 81a, b.*

42. **Micropuccinia Waldsteiniae** (M. A. Curt.) Arth. & Jackson; Arth. Bull. Torrey Club **48**: 42. 1921.

Puccinia Waldsteiniae M. A. Curt.; Peck, Ann. Rep. N. Y. State Mus. **25**: 120. 1873.
Dicaeoma Waldsteiniae Kuntze, Rev. Gen. **3**[3]: 471. 1898.

O. Pycnia unknown.

III. Telia hypophyllous, scattered or occasionally crowded in groups 2 mm. in diameter upon somewhat purplish spots, round, 0.2–1 mm. in diameter, early naked, compact, pulvinate, chocolate-brown, ruptured epidermis conspicuous; teliospores clavate or cylindric, 13–18 by 40–55 μ, rounded or obtuse above, narrowed or rounded below, somewhat constricted at septum; wall chestnut-brown at apex, lighter below, thin, 1–1.5 μ, considerably thickened at apex, 5–12 μ, smooth; pedicel cinnamon-brown, up to twice length of spore.

ON ROSACEAE:

Waldsteinia fragarioides (Michx.) Tratt., New York; Ontario.
Waldsteinia idahoensis Piper, Idaho.

TYPE LOCALITY: Fort Edward, New York, on *Waldsteinia fragarioides*.
DISTRIBUTION: Throughout New York, southwestern Ontario, and northern Idaho.
ILLUSTRATION: Holway, N. Am. Ured. **1**: *pl. 23, f. 82*.
EXSICCATI: Barth. Fungi Columb. *2972;* Barth. N. Am. Ured. *581;* Ellis, N. Am. Fungi *1050;* Ellis & Ev. Fungi Columb. *1775*.

43. **Micropuccinia Leveillei** (Mont.) Arth. & Jackson; Arth. Bull. Torrey Club **48**: 41. 1921.

Puccinia Geranii Lév. Ann. Sci. Nat. III. **5**: 270. 1846. Not *P. Geranii* Corda, 1840.
Puccinia Leveillei Mont. in C. Gay, Fl. Chil. **8**: 41. 1852.
Puccinia Geranii-silvatici P. Karst. Not. Sällsk. Faun. Fl. Fenn. **8**: 220. 1869.
Puccinia semireticulata Fuckel, Jahrb. Nass. Ver. Nat. **29–30**: 12. 1875.
Puccinia Fuckelii Körn. Hedwigia **16**: 20. 1877.
Puccinia Leveilleana De-Toni, in Sacc. Syll. Fung. **7**: 696. 1888.
Dicaeoma Geranii-silvatici Kuntze, Rev. Gen. **3**[3]: 469. 1898.
Dicaeoma Leveillei Kuntze, Rev. Gen. **3**[3]: 469. 1898.
Dasyspora Geranii-silvatici Arth. Résult. Sci. Congr. Bot. Vienne 346. 1906.

O. Pycnia unknown.

III. Telia hypophyllous, or caulicolous, rarely epiphyllous, small, round, 0.5–0.8 mm. across, gregarious and often confluent in orbicular groups on purplish spots, or in elongate groups 1–3 cm. long on veins and petioles, often resulting in considerable distortion, early naked, pulverulent, chestnut-brown, ruptured epidermis conspicuous; teliospores broadly ellipsoid, 16–22 by 26–34 μ, rounded above, rounded or somewhat narrowed below, not constricted at septum; wall chestnut-brown, 1.5–3 μ thick, not or scarcely thickened above, 3–4 μ, strongly and closely verrucose on upper cell, usually less prominently so on lower cell, the pore of upper cell at apex, of lower cell depressed half way or near pedicel; pedicel colorless, slender, twice length of spore, deciduous, leaving 7–10 μ attached to spore.

ON GERANIACEAE:

Geranium incisum Nutt. (*G. oreganum* Howell), Washington.
Geranium nervosum Rydb., Utah.
Geranium Richardsonii Fisch. & Trautv. (*G. albiflorum* Hook.), Colorado, Utah.
Geranium viscosissimum Fisch. & Mey., Montana.
Geranium sp., Wyoming.

TYPE LOCALITY: Chile, on "*Geranium dissectum,*" now considered to be *G. rotundifolium*.
DISTRIBUTION: Mountains of southern Colorado and Utah, northward to Montana and eastern Washington; also in Europe and South America.
ILLUSTRATIONS: Ber. Deuts. Bot. Ges. **31**: *pl. 4, f. 1–7, 18–22;* Holway, N. Am. Ured. **1**: *pl. 24, f. 84*.
EXSICCATI: Ellis & Ev. Fungi Columb. *1572;* Ellis & Ev. N. Am. Fungi *2240;* Garrett, Fungi Utah. *88, 101;* Vesterg., Micr. Rar. Sel. *965*.

44. **Micropuccinia Pyrolae** (Cooke) Arth. & Jackson; Arth. Bull. Torrey Club **48**: 41. 1921.

Puccinia Pyrolae Cooke, Proc. Portl. Soc. Nat. Hist. **1**: 183. 1862.
Puccinia Polygalae Paz.; Rab.-Wint.-Paz. Fungi Eur. *4029*. 1895.
Dicaeoma Pyrolae Kuntze, Rev. Gen. **3**[3]: 470. 1898.
Dasyspora Pyrolae Arth. Résult. Sci. Congr. Bot. Vienne 347. 1906.

O. Pycnia unknown.

III. Telia mostly hypophyllous and caulicolous, circinating on slightly lighter colored

COMPLETED VOLUME

9: i–iv, 1–542. (Agaricales:) Polyporaceae (pars), Boletaceae, Agaricaceae (pars). Complete in 7 parts.

PARTS OF VOLUMES PREVIOUSLY PUBLISHED

3[1]: 1–88. Hypocreales: Nectriaceae, Hypocreaceae. Fimetariales: Chaetomiaceae, Fimetariaceae.

6[1]: 1–84. Phyllostictales: Phyllostictaceae (pars).

7[1]: 1–82. Ustilaginales: Ustilaginaceae, Tilletiaceae. **7**[2]: 83–160. Uredinales: Coleosporiaceae, Uredinaceae, Aecidiaceae (pars). **7**[3]: 161–268. Aecidiaceae (pars). **7**[4]: 269–336. Aecidiaceae (pars). **7**[5]: 337–404. Aecidiaceae (pars). **7**[6]: 405–480. Aecidiaceae (pars).

10[1]: 1–76. (Agaricales:) Agaricaceae (pars). **10**[2]: 77–144. Agaricaceae (pars). **10**[3]: 145–226. Agaricaceae (pars).

15[1]: 1–75. Sphagnales: Sphagnaceae. Andreaeales: Andreaeaceae. Bryales: Archidiaceae, Bruchiaceae, Ditrichaceae, Bryoxyphiaceae, Seligeriaceae. **15**[2]: 77–166. Dicranaceae, Leucobryaceae.

16[1]: 1–88. Ophioglossales: Ophioglossaceae. Marattiales: Marattiaceae. Filicales: Osmundaceae, Ceratopteridaceae, Schizaeaceae, Gleicheniaceae, Cyatheaceae (pars).

17[1]: 1–98. Pandanales: Typhaceae, Sparganiaceae. Naiadales: Zannichelliaceae, Zosteraceae, Cymodoceaceae, Naiadaceae, Lilaeaceae. Alismales: Scheuchzeriaceae, Alismaceae, Butomaceae. Hydrocharitales: Elodeaceae, Hydrocharitaceae. Poales: Poaceae (pars). **17**[2]: 99–196. Poaceae (pars). **17**[3]: 197–288. Poaceae (pars).

21[1]: 1–93. Chenopodiales: Chenopodiaceae. **21**[2]: 95–169. Amaranthaceae. **21**[3]: 171–254. Allioniaceae.

22[1]: 1–80. Rosales: Podostemonaceae, Crassulaceae, Penthoraceae, Parnassiaceae. **22**[2]: 81–192. Saxifragaceae, Hydrangeaceae, Cunoniaceae, Iteaceae, Pterostemonaceae, Hamamelidaceae, Altingiaceae, Phyllonomaceae. **22**[3]: 193–292. Grossulariaceae, Platanaceae, Crossosomataceae, Connaraceae, Calycanthaceae, Rosaceae (pars). **22**[4]: 293–388. Rosaceae (pars). **22**[5]: 389–480. Rosaceae (pars). **22**[6]: 481–560. Rosaceae (pars).

24[1]: 1–64. (Rosales:) Fabaceae (pars). **24**[2]: 65–136. Fabaceae (pars).

25[1]: 1–88. Geraniales: Geraniaceae, Oxalidaceae, Erythroxylaceae, Linaceae. **25**[2]: 89–171. Tropaeolaceae, Balsaminaceae, Limnanthaceae, Koeberliniaceae, Zygophyllaceae, Malpighiaceae. **25**[3]: 173–261. Rutaceae, Surianaceae, Simaroubaceae, Burseraceae.

29[1]: 1–102. Ericales: Clethraceae, Monotropaceae, Lennoaceae, Pyrolaceae, Ericaceae.

32[1]: 1–86. Rubiales: Rubiaceae (pars). **32**[2]: 87–158. Rubiaceae (pars).

33[1]: 1–110. Carduales: Ambrosiaceae, Carduaceae (pars).

34[1]: 1–80. (Carduales:) Carduaceae (pars). **34**[2]: 81–180. Carduaceae (pars). **34**[3]: 181–288. Carduaceae (pars).

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